DRAFT

URBAN RIVER MANAGEMENT PLAN

GORAKHPUR

NAMAMI GANGE

National Institute of Urban Affairs

LEA

GORAKHPUR MUNICIPAL CORPORATION
UTTARPRADESH

09 JANUARY, 2026

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ABBREVIATIONS

S.no.	Abbreviations	Full form
1.	ADM	Additional District Magistrate
2.	ADB	Asian Development Bank
3.	AMRUT	Atal Mission for Rejuvenation and Urban Transformation
4.	BOD	Biological Dissolved Oxygen
5.	CPCB	Central Pollution Control Board
6.	DFO	Divisional Forest Officer
7.	DPO	District Planning Officer
8.	DUDA	District Urban Development Agency
9.	DO	Dissolved Oxygen
10.	FSTP	Faecal Sludge Treatment Plant
11.	GMC	Gorakhpur Municipal Corporation
12.	GNN	Gorakhpur Nagar Nigam
13.	GDA	Gorakhpur Development Authority
14.	GIDA	Gorakhpur Industrial Development Authority
15.	GPA	Gorakhpur Planning Area
16.	IEC	Information Education Communication
17.	MSWG	Multi-Stakeholder Working group
18.	MoEFCC	Ministry of Environment, Forest and Climate Change.
19.	NGT	National Green Tribunal
20.	NIUA	National Institute of Urban Affairs
21.	NMCG	National Mission for clean Ganga
22.	NTPC	National Thermal Power Corporation Ltd.
23.	SHG	Self Help Groups
24.	STP	Sewerage Treatment plant
25.	SOPs	Standard Operating Procedure
26.	SBM	Swatch Bharat Mission
27.	SMCG	State Mission for Clean Ganga
28.	TCPO	Town and Country Planning Organization
29.	TDS	Total dissolved solids
30.	URMP	Urban River Management Plan
31.	UDD	Urban Development Department
32.	ULBs	Urban Local Bodies
33.	UP SUDA	Uttar Pradesh State Urban Development Agency (SUDA)
34.	UPFC	Uttar Pradesh Forest Corporation
35.	UPPCB	Uttar Pradesh Pollution Control Board
36.	WWF	World Wide Fund for Nature
37.	WTP	Water Treatment Plant

EXECUTIVE SUMMARY

A river and a city have a symbiotic relationship. The river provides the "life" (resources, climate regulation, identity), and in return, the city acts as the "steward" (protecting the catchment, managing flow, and maintaining biodiversity). However, in recent times this relationship has devolved into parasitism, where the city extracts resources and dumps waste, slowly killing the host river. Urban River Management Plan (URMP) is a strategic framework designed to shift the urban-river dynamic from "exploitation" (parasitism) to "stewardship" (symbiosis).

The purpose of the Urban River Management Plan (URMP) Gorakhpur is to develop a dedicated strategy for managing the Rapti and Rohini River and its tributaries that flows through the city in an efficient and sustainable manner.

The purpose of this document (Urban River Management Plan, URMP of Gorakhpur is to develop a dedicated strategy for managing the extent of Rapti and Rohini River and its tributaries that flow through the city of Gorakhpur in an efficient and sustainable manner. The document is based on the Strategic Framework for Managing Urban River Stretches developed by the National Institute of Urban Affairs (NIUA), in association with the National Mission for Clean Ganga (NMCG).

The URMP proposes **30 tangible and practical actions in addition to several recommendations for managing the river under a ten-point agenda** (or objectives) to ensure the "Nirmal" and "Aviral" nature of the rivers in the city. The level of detail for the interventions is restricted to the concept idea for general understanding. Detailed Project Reports (DPRs) will be prepared for each intervention based on the concept ideas proposed in the document. The URMP document is a living document, which will address issues related to river management on continuous basis.

Approach adopted for preparing the URMP for Gorakhpur

At the start, a core Multistakeholder Working Group (MSWG) comprising 18 members, chaired by Hon'ble Mayor and Municipal Commissioner, Gorakhpur was set up to lead the development of the URMP for Gorakhpur. The team from NIUA and NMCG helped facilitate the MSWG meeting.

This was followed by a rapid baseline assessment to understand river-related issues and challenges faced by the city and identify opportunities to enhance river-city interaction. The assessment was based on secondary data, published reports, and projects implemented / under implementation within the city. The baseline included information on planning provisions related to river, streams, drains etc; status of river pollution, groundwater status, encroachments in floodplain etc; and ongoing projects in the city on rivers, streams and drains.

On the basis of the rapid baseline assessment and discussions with MSWG members, 30 projects/interventions were identified that will be taken up in Gorakhpur's URMP.

Envisaged benefits of the URMP for Gorakhpur city

It is envisaged that implementing the URMP will yield several tangible and intangible benefits, as listed below.

1. It will improve climate resilience and environmental outlook of the city, making it more appealing to residents and visitors as well as help in providing ancillary benefits such as water pollution control, thriving biodiversity, flood mitigation, and improved groundwater recharge.

2. It will improve the connect between the residents and the river by creating avenues for recreation, social bonding, and leisure thereby improving the quality of life of the residents.
3. It will boost the city's river-related economy and provide livelihood for multiple stakeholders.
4. The URMP will create a premise for shared governance with key stakeholders and citizens and enable them to take on a more active role in managing the city's environmental assets and instilling a sense of ownership around actionable items.

Interventions proposed in URMP

The table on next page presents the key details of the 30 interventions that includes the agencies responsible for implementation, estimated costs, and the source of funding for each intervention.

Sl. No.	URMP Objective	Intervention	Responsible Agency	Estimated Cost (In rupees)	Potential Financing Sources
1	**Regulation of Activities in Flood Plains**	Intervention 1: Inclusion and strengthening of provisions in Master Plan of Gorakhpur, 2031	Town & Country Planning Department, Uttar Pradesh; GDA; GMC; Irrigation Department	-	-
		Intervention 2: Relocation of Un-authorized Settlements in Floodplains	Town & Country Planning Department, Uttar Pradesh; GDA; GMC; Irrigation Department	-	-
2	**To keep river free from pollution**	Intervention 3: Construction of I&D structure at AIIMS Nallah at RKBK	Jal Nigam Urban	₹ 2 Cr	AMRUT, NMCG
		Intervention 4: Removal of solid waste from the drain through litter trap	Jal Nigam Urban	₹ 1.9 cr	AMRUT, NMCG
		Intervention 5: Strengthening of faecal sludge treatment facilities in the city"	-	-	-
		Intervention 5a: Construction of 3 Nos. Co-Treatment	Jal Nigam Urban	₹ 7.2 Cr	AMRUT, NMCG

Sl. No.	URMP Objective	Intervention	Responsible Agency	Estimated Cost (In rupees)	Potential Financing Sources
		Plants in existing / under construction STPs.			
		Intervention 5b: Construction of 20 KLD Faecal Sludge Treatment Plant (FSTP) in Zone-D	Jal Nigam Urban	₹ 4 Cr	AMRUT, NMCG
		Intervention 6: Preparation of Faecal and Septage Management Plan	Lead: GMC Support: Jal Kal and Jal Nigam	₹ 0.5 Cr	SUDA; SBM (Urban) – FSSM component; AMRUT
		Intervention 7: Strengthening the treatment components of existing phytoremediation project in Ilahibagh Nallah	Jal Nigam Urban, GMC	₹ 1.9 Cr	AMRUT, NMCG
		Intervention 8: Monetizing the water hyacinth removed from Ramgarh Tal and Chillua Tal	GDA, GMC	Ramgarh Tal - ₹ 25 Cr Chillua Tal - ₹ 0.45 Cr	UPNEDA, SBM 2.0, DAY NULM, PPP
3	**To rejuvenate waterbodies and wetlands in the city**	Intervention 9: To create Water Body Database at City level and integration with the existing ICCC of the municipal corporation	GMC, GDA, UPPCB	₹ 12.3 Cr	AMRUT 2.0 – Reform & Capacity Building Component, NMCG, UP Urban Development funds, 15th Finance Commission – Tied Grants (Water & Sanitation
		Intervention 10: To undertake urban waterbody rejuvenation	GMC	₹ 0.58 Crs (for 1 Waterbody as per DPR & feasibility)	AMRUT 2.0 – Water & Green Infrastructure Components, NMCG, NPCA, 15th FC, GMC Own Funds

Sl. No.	URMP Objective	Intervention	Responsible Agency	Estimated Cost (In rupees)	Potential Financing Sources
		Intervention 11: Development of parks and cycle tracks along Gurdahiya Nallah	GMC	₹57.6 Cr	Municipal, NMCG, AMRUT, MoHUA-Urban Mobility Grants, CSR
4	**To enhance riparian buffer along river bank**	Intervention 12: Plantation of Native Species for bank stabilization with NBS along southern edge of Rapti river and Northern Periphery of the Rohini River	Forest Department, GMC, Irrigation Dept.	₹12.5 Cr	CSR, Namami Gange, Forest funds, National Green Mission, CAMPA funds
		Recommendation 1: Conservation and Preservation of Natural dense riparian buffer along Rapti and Rohini Rivers	-	-	-
5	**Reuse of treated used water**	Intervention 13: Enhance the reuse of treated used water in the city	Jal Nigam Urban; GMC; North Eastern Railway-Gorakhpur	₹20.2 Cr	AMRUT, NMCG, State Urban Development Funds
7	**To develop eco-friendly riverfront projects**	Intervention 14: Develop an eco-friendly riverfront at Ekla Bandha	GMC, Tourism Department	₹43.35 Cr (subject to DPR	AMRUT 2.0, NMCG, State Budget Allocations, Uttar Pradesh Tourism Department Grants, CSR
		Intervention 15: Integration of Raj Ghat, Ram Ghat and Ekla Bandha riverfront developments	GMC, Tourism Department	₹18.19 Cr (subject to DPR	AMRUT 2.0, NMCG, State Budget Allocations, Uttar Pradesh Tourism Department Grants, CSR
		Recommendation 2: Modify design of Eco-Sponge Park at Mahesara Tal/Chillua Tal to include nature based and flood sensitive designs	-	-	-

Sl. No.	URMP Objective	Intervention	Responsible Agency	Estimated Cost (In rupees)	Potential Financing Sources
8	**To leverage the economic potential of the river**	Intervention 16: Riverfront Tourism & Recreation	GMC (Lead), Tourism Department, SHGs, NGOs	₹0.20 Cr	Municipal sanitation budget, CSR (local industries), temple trusts, IEC (Namami Gange)
		Intervention 17: Value Addition to River Resources	GMC, Tourism Dept., SHGs, NGOs, GDA	₹0.15 Cr	IEC budgets, CSR (banks, industries), RWAs, UPNEDA, PPP
		Intervention 18: SHG-Operated Kiosks	GMC, Tourism Dept., SHGs, NGOs, GDA	₹0.15 Cr	IEC (Namami Gange), CSR (railways, industries), DAY NULM for SHG skilling
		Intervention 19: Boating Economy at Raj Ghat	GMC, Temple Committees, SHGs, NGOs	₹0.12 Cr	Municipal sanitation budget, CSR (local businesses), temple trusts, IEC (Namami Gange
		Intervention 20: Workforce Training for New River-Based Economies	GMC, ITI Gorakhpur, Gorakhpur University, vocational institutes	Training program costs integrated with DAY NULM and Tourism Department grants.	DAY NULM, Tourism Department grants, CSR
9	**To inculcate river-sensitive behaviour among citizens**	Intervention 21: Interpretive Signage and QR-Coded Storytelling Boards at major public spots	GMC; Supporting Agencies: NMCG, SHGs, NGOs, educational institutions	₹ 0.20 cr	. IEC Budget: Nagar Nigam & Namami Gange, CSR: Railways, forest industries, local banks, Community: RWAs & heritage NGOs.
		Intervention 22: Distribution of Biodegradable Offering Kits at Sacred Sites in Gorakhpur City	GMC; Supporting Agencies: Temple committees, SHGs, NGOs	₹ 0.18	Municipal sanitation budget, CSR (local businesses, flower vendors), Temple trusts & SHG cost-sharing, IEC support (Namami Gange
		Intervention 23: Awareness and utilization campaign	GMC; Supporting Agencies:	₹ 0.37 cr	SBM(U) and NMCG subsidies, CSR funds from local

Sl. No.	URMP Objective	Intervention	Responsible Agency	Estimated Cost (In rupees)	Potential Financing Sources
		for promoting the use of existing electric crematorium facility at Raj Ghat	Religious Boards, SHGs, NGOs		industries/businesses, Funding from religious boards & funeral trusts
		Intervention 24: Organizing community-led solid waste clean-up campaigns along nallahs and riverbanks	GMC; SBM cell; Supporting Agencies: SHGs, NGOs	₹ 0.04 cr	Municipal IEC budget allocation under SBM(U), CSR funds telecom
		Intervention 25: Annual Celebration of "River Utsav"	GMC; Supporting Agencies: Tourism and Educational Departments, SBM, RWAs and NGOs	₹0.40 cr	NMCG, Municipal cultural allocations, CSR contributions (industries, banks, tourism stakeholders), State Tourism Department.
		Intervention 26: Establishment of kiosks operated by Self-Help Groups (SHGs) at the Ram Ghat, Raj Ghat, Ramgarh Tal and Chillua Tal Lakefront	GMC; Supporting Agencies: Temple committees, SHGs, NGOs	₹0.18	Municipal sanitation budget, CSR (local businesses, flower vendors),Temple trusts & SHG cost-sharing,IEC support (Namami Gange)
10	**To engage citizens in river management activities**	Intervention 27: Short Videos and Jingles on Segregation and Composting of Solid Waste	GMC	₹0.25cr	Municipal budget, NGO, CSR contributions.
		Intervention 28: Promote youth participation in conservation and awareness programs focused on both Rapti and Rohini River.	Education Department; Supporting Agencies: Schools, Colleges and NGOs	₹0.05 cr	Education Department, Municipal IEC Budget, CSR contributions from schools, coaching institutes and NGO.
		Intervention 29: Street Plays (Nukkad Natak) by RWAs &local community	GMC; Supporting Agencies:	₹0.08 cr	Municipal IEC Budget

Sl. No.	URMP Objective	Intervention	Responsible Agency	Estimated Cost (In rupees)	Potential Financing Sources
			RWAs, SHGs and NGOs		
		Intervention 30: Engage Local Residents in River Clean-Up Drives	River Sabha Committees; Supporting Agencies: RWAs, SHGs and NGOs	₹0.12 cr	Municipal IEC budget allocation under SBM(U) and CSR funds, Community contributions (RWAs)
	Total			**Approx. ₹ 210.53 Crore**	

1 INTRODUCTION

The National Institute of Urban Affairs (NIUA) and the National Mission for Clean Ganga (NMCG) have collaborated to promote river-sensitive urban development across cities in the Ganga basin and other Indian river basins. This collaboration aims to harness the role of the cities to rejuvenate and restore river health. As part of this initiative, two major support systems have been developed: Urban River Management Plan (URMP) Framework and Guidelines for creating River-Sensitive Master Plans.

The framework was prepared to help cities improve and sustain river stretches within their boundaries through holistic, ecosystem-based interventions. It underscores that healthy river are essential for urban livability and productivity, and its vision is organized around three elements—environmental, economic, and social supported by ten objectives. These objectives are translated into city-specific projects, each tied to funding sources and institutional mechanisms for effective implementation.

Figure 1-1: Ten Objectives of the URMP

A total of sixty URMPs are planned in two phases with 25 in Phase I and 35 in Phase II, including five cities in Uttarakhand in the first phase. Funded by the World Bank under Namami Gange Mission II, this initiative is expected to guide Urban Local Bodies (ULBs) in addressing challenges such as drying rivers, poor waste management, loss of green cover, floodplain encroachment, and industrial pollution through systematic, city-level planning. The three tiers of governance and monitoring committees at the centre, state and city level is depicted in Figure 1-2.

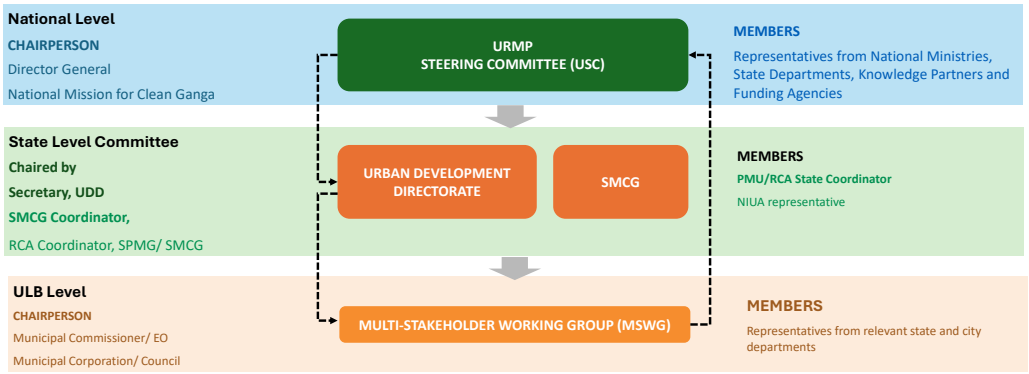


Figure 1-2: National, State & City Engagement for the URMP Preparation

1.1 Process for preparation of the URMP Gorakhpur

The preparation of an URMP follows a systematic approach as per the NIUA's URMP Components and Guidance Note 2020 and strategic guidelines for making River Sensitive Master Plans 2021 to ensure effective river conservation, sustainable management and stakeholder collaboration. The process involves multiple stages, each contributing to a comprehensive and actionable plan as depicted below.

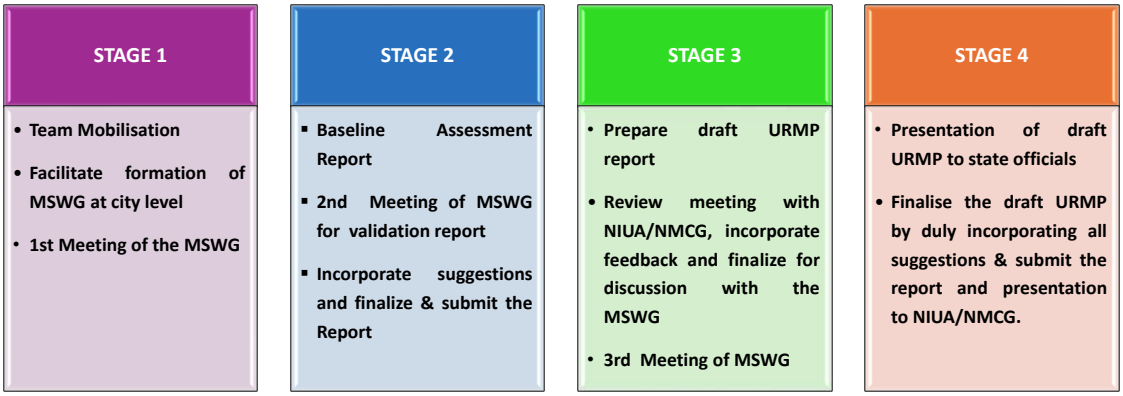


Figure 1-3: Process for preparation of URMP

In order to ensure that the plan is participatory and has involvement of concerned government agencies from the state to the city level, workshops and meetings have been carried out at all levels.

1.2 Status of Work and Contents of the Present Deliverable

Tasks one to three as listed in the previous section have been completed and findings are elaborated in the present deliverable of Draft URMP Report. The detailed content of the report includes the following:

- Key points discussed during URMP State level Steering Committee Workshop for Uttar Pradesh held on 3rd May 2025 at Lucknow,
- Discussions during first Multistakeholder Working Group (MSWG) meeting at Gorakhpur on 21st May 2025;
- Analysis of the field visit, primary and secondary data available in the public domain and collected from various stakeholder departments post the MSWG meeting.

1.2.1 URMP State level Workshop

A State-level URMP Committee, chaired by Secretary, Urban Development Department (UDD), Government of Uttar Pradesh has been constituted to oversee the URMP process. A State level Workshop was held on 3rd May 2025 at Lucknow chaired by Deputy Director General, NMCG and attended by Director Local Bodies & Secretary, Urban Development Department (UDD) UP, Director, NMCG, Urban Lead, NMCG, Technical Advisor, State Mission for Clean Ganga (SMCG), UP and representatives from NMCG, SMCG, State UDD, Directorate of ULBs, city representatives ULBs and NIUA.

The meeting presented the guiding principles, objectives and work plan for preparing URMPs in five cities of the state. Commissioners, Executive Officers and senior officials shared the current status, challenges and future plans for river management in their cities.

Image 1-1: State Level Workshop for Uttar Pradesh on 3 May 2025

1.2.2 Multistakeholder Working Group

To guide the development of city URMP a Multistakeholder Working Group (MSWG) was formed comprising 18 representatives from District Magistrate, Municipal Corporation, Gorakhpur Development Authority, Forest Department, Irrigation Department, District Agriculture Department, Jal Kal Department, Jal Nigam-Urban, Pollution Control Board, PWD, District Industries Centre, Tourism Department, District Disaster Management Authority and NGO. Post the state level workshop, the first MSWG meeting was held on 21st May 2025 under the chairmanship of Hon'ble Mayor and Municipal Commissioner, Gorakhpur to notify the MSWG for the city and the nodal officer for the URMP (Refer Image 1-2).

Image 1-2: MSWG held on 21st May 2025 at Gorakhpur

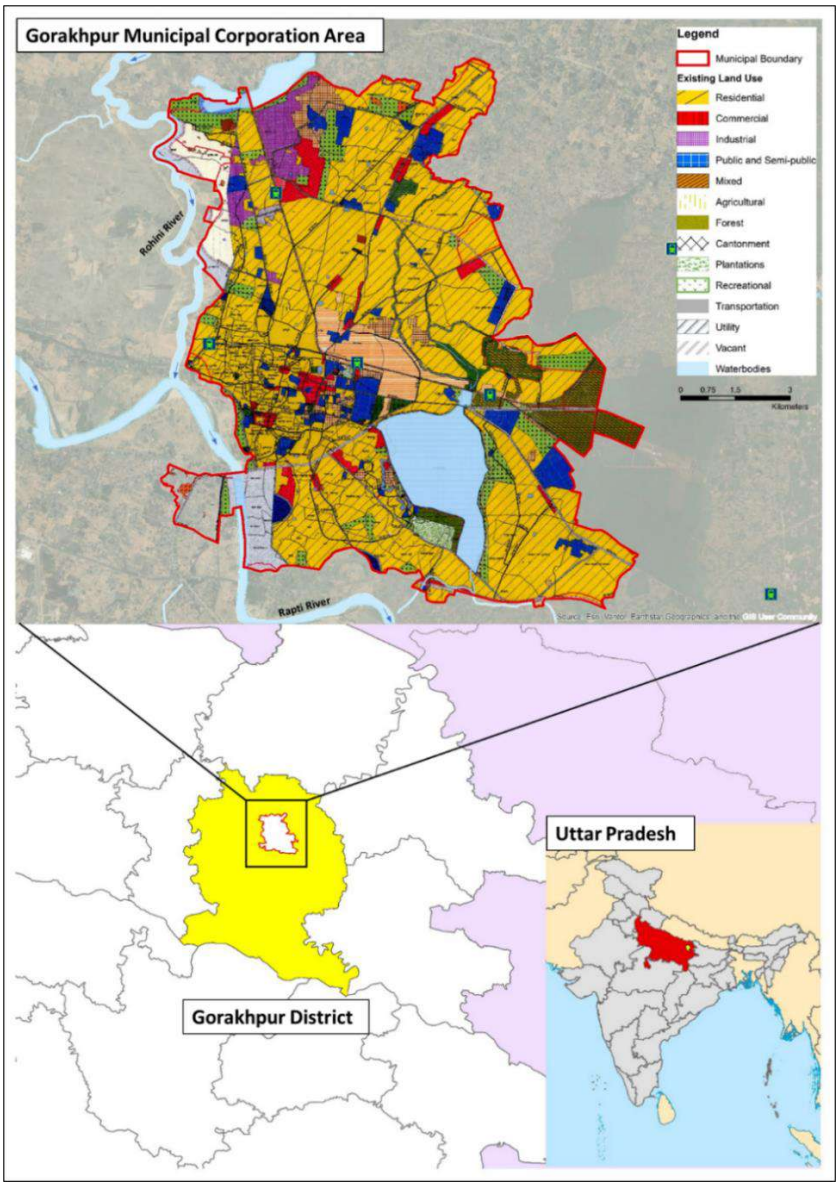
1.2.3 Draft URMP Report

The draft URMP report includes tangible interventions for river conservation and management for each of the ten URMP objectives. Multiple meetings and consultations with all the concerned agencies along with site visits were conducted to assess the ground situation and identify opportunities for future interventions (refer Image 1-3). Based on the gaps and prioritized issues identified in the Baseline Assessment Report, this document outlines interventions and recommended actions. Each intervention is elaborated in detail, including the project rationale, conceptual framework, key components, broad cost estimates and the designated implementing agency.

Image 1-3: Consultation and Site Visits

2 CITY PROFILE

Gorakhpur is a major city and the administrative headquarters of Gorakhpur district in eastern Uttar Pradesh. The city is situated in the Terai region, near the confluence of the Rapti and Rohini Rivers. Rapti River eventually joins Ghaghara River near Patana Village (near Kaparwar Bridge) in Uttar Pradesh, which is a tributary of the Ganga River. Gorakhpur lies about 300 km from Lucknow, 850 km from Delhi, and 95 km from the India–Nepal border, with Varanasi (193 km) and Patna (260 km) also nearby. The city is connected by National Highway-28 to Lucknow, Delhi, and Kolkata via Bihar, and by National Highway-29 to Varanasi and Allahabad. It also serves as a gateway to the Buddhist Tourist Circuit, linking major pilgrimage sites such as Kushinagar (50 km), Lumbini (95 km), Kapilvastu (110 km), Sravasti (160 km), and Sarnath (220 km).



Map 2-1: Contextual Setting of Gorakhpur city

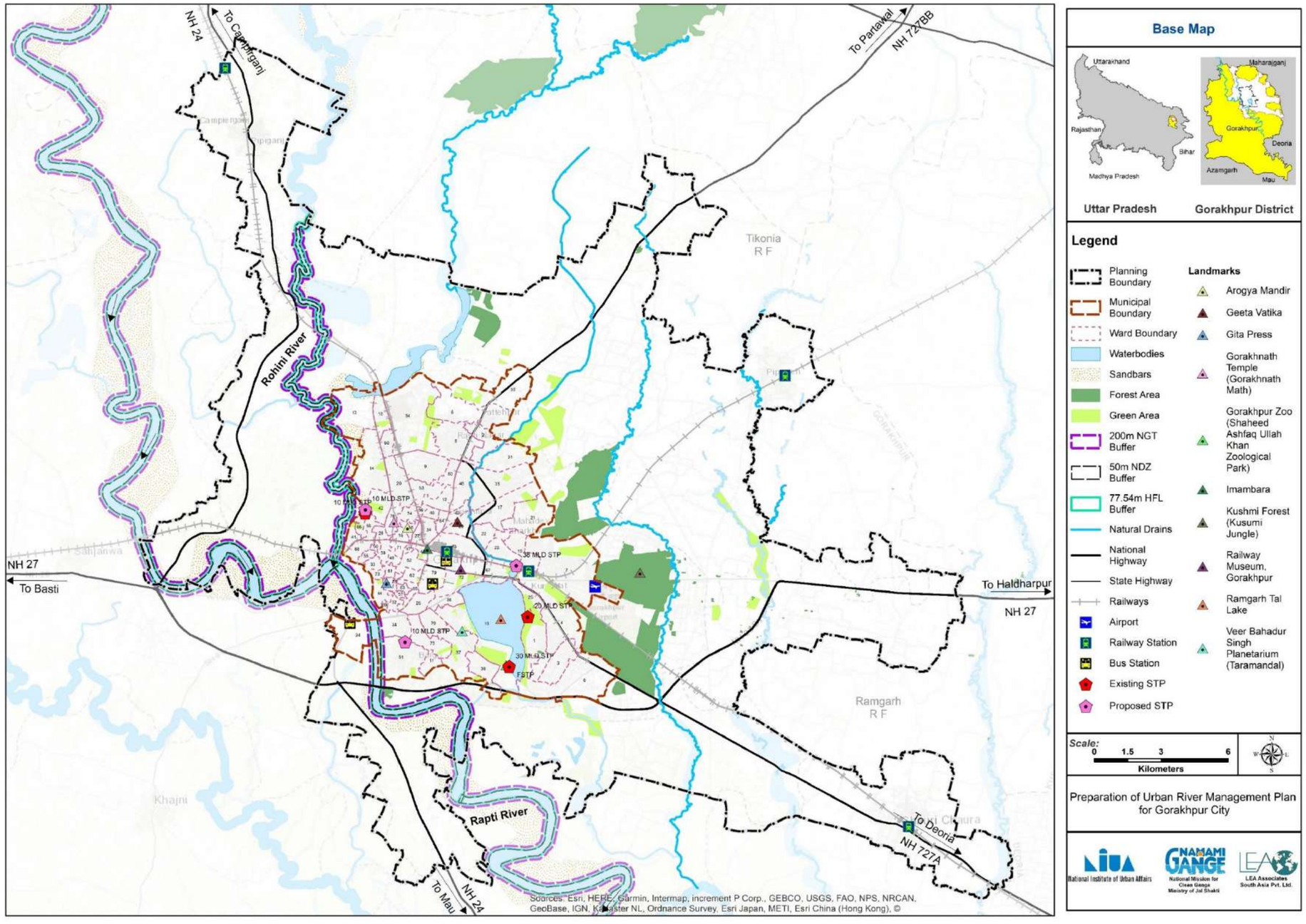
2.1 City Administrative Boundaries

The Gorakhpur Planning Area (GPA) covers approximately 643 sq.km and comprises the GMC, Nagar Panchayats of Pipi Ganj. Pipraich and Mundera Bazar along with 319 villages. The GPA is under the jurisdiction of the Gorakhpur Development Authority (GDA).

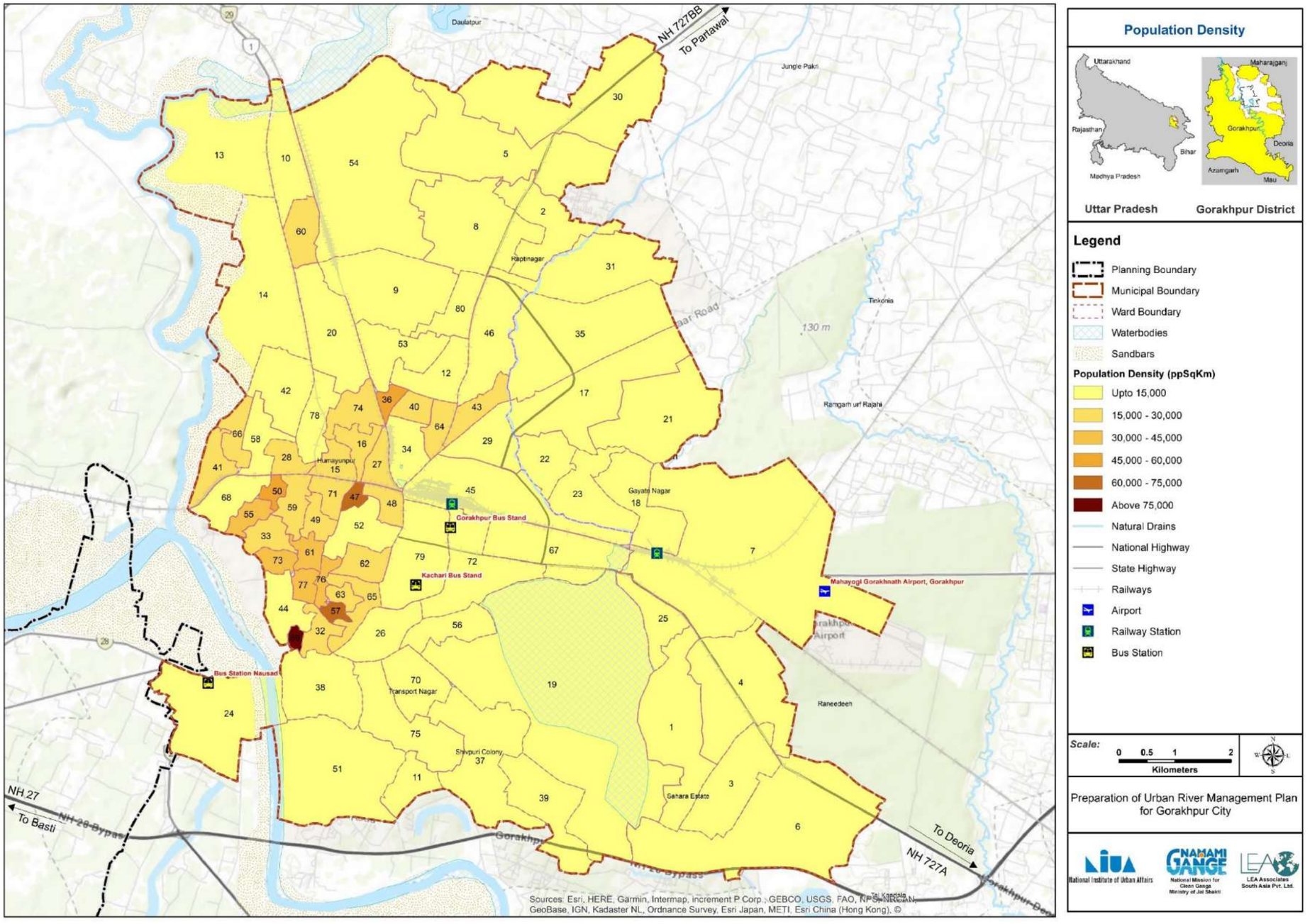
Gorakhpur Municipal Corporation was established on 7th September 1869 and formed Municipal Corporation (Nagar Nigam) in 1994. The Gorakhpur Municipal Corporation (GMC) spans an area of approximately 226 sq.km. The city is divided into 80 administrative wards.

2.2 Demography

The total population of the municipal corporation is 7,74,550 (Census 2011) and the population in planning area is 14,91,807. Based on the current decadal growth trend, population for the year 2025 (base year) is estimated to be approximately 9.3 lakhs for the municipal area. The population of Gorakhpur city is expected to grow up to 16.23 lakhs in 2051.



Map 2-2: Administrative map of Gorakhpur



Map 2-3: Population density map of Gorakhpur

2.3 Physiographic Profile

2.3.1 Topography

Gorakhpur is in the Ghaghra-Gandak Doab, a sub-region of the expansive Indo-Gangetic alluvial plain.

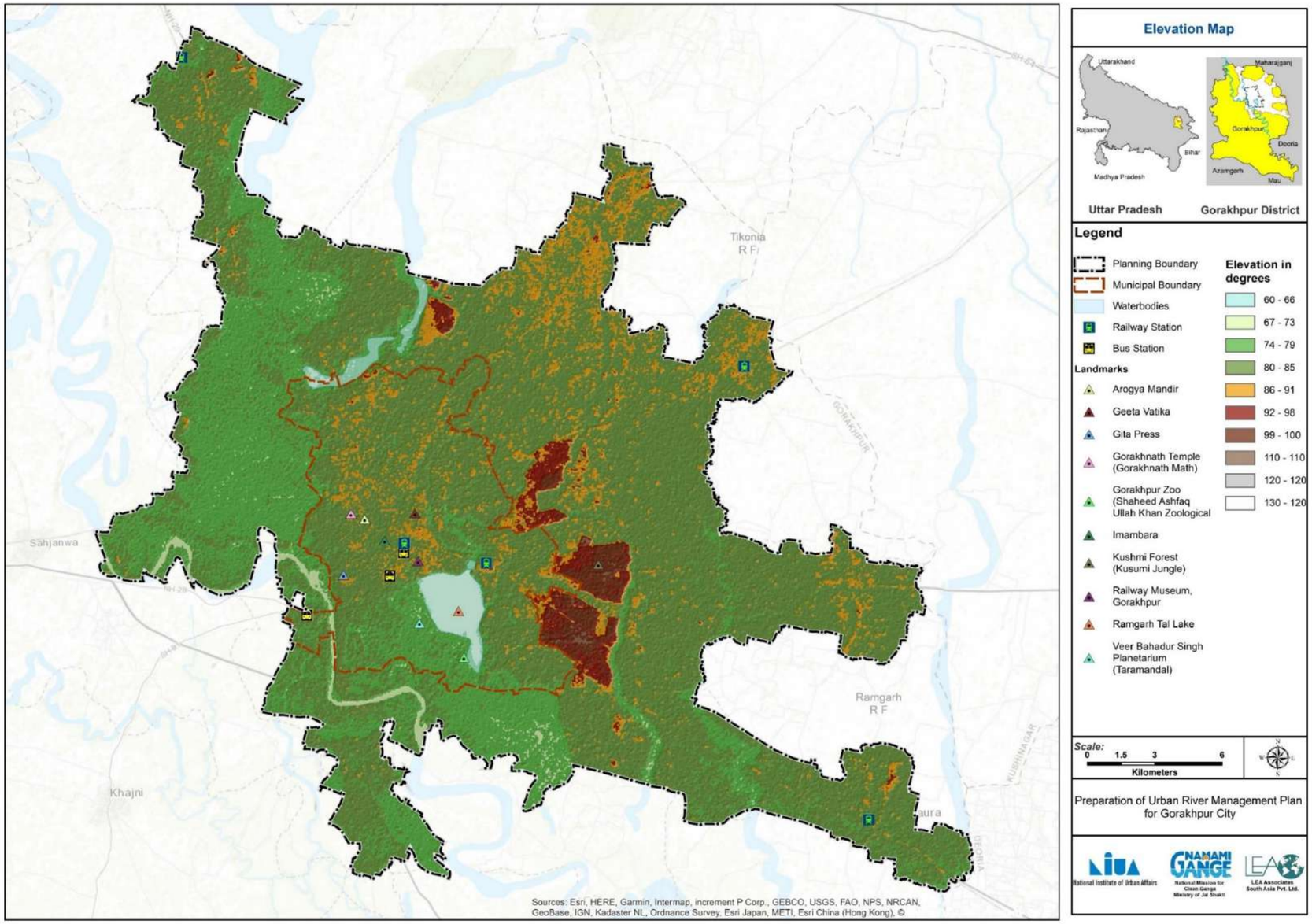
The city lies at an average elevation, 102 meters above sea level. Its saucer-shaped topography where the central area sits in a shallow bowl surrounded by slightly elevated peripheries which limits the natural gradient for rainwater runoff.

2.3.2 Geophysical Characteristic

Gorakhpur lies within the Tarai region of the Indo-Gangetic plain, characterized by a flat to gently undulating terrain shaped by continuous fluvial activity and Himalayan alluvial deposition. The city's geomorphology reflects the dynamic interaction of rivers and floodplains, which have created a landscape of fertile soils and low-lying depressions.

The Rapti River, flowing along the southern and western edges of the city, plays a defining role in shaping its physical environment. Over time, the river has altered its course, leaving behind oxbow lakes, wetlands, and shallow depressions that punctuate the urban fabric. The Rohini River, joining the Rapti as a left-bank tributary within Gorakhpur, further contributes to the hydrological complexity of the area. Together, these rivers have sculpted a distinctive geomorphological setting that underpins both the city's ecological character and its development challenges.

The soil profile of Gorakhpur is predominantly composed of fine to medium alluvial deposits, including sand, clay, and silt. These soils possess moderate permeability, which facilitates groundwater recharge but also leads to waterlogging in low-lying areas, particularly in the southern parts of the city. The stratification of alternating sand and clay layers enhances vertical water movement, while deeper horizons occasionally feature patches of kankar and sandstone, influencing subsurface drainage characteristics.

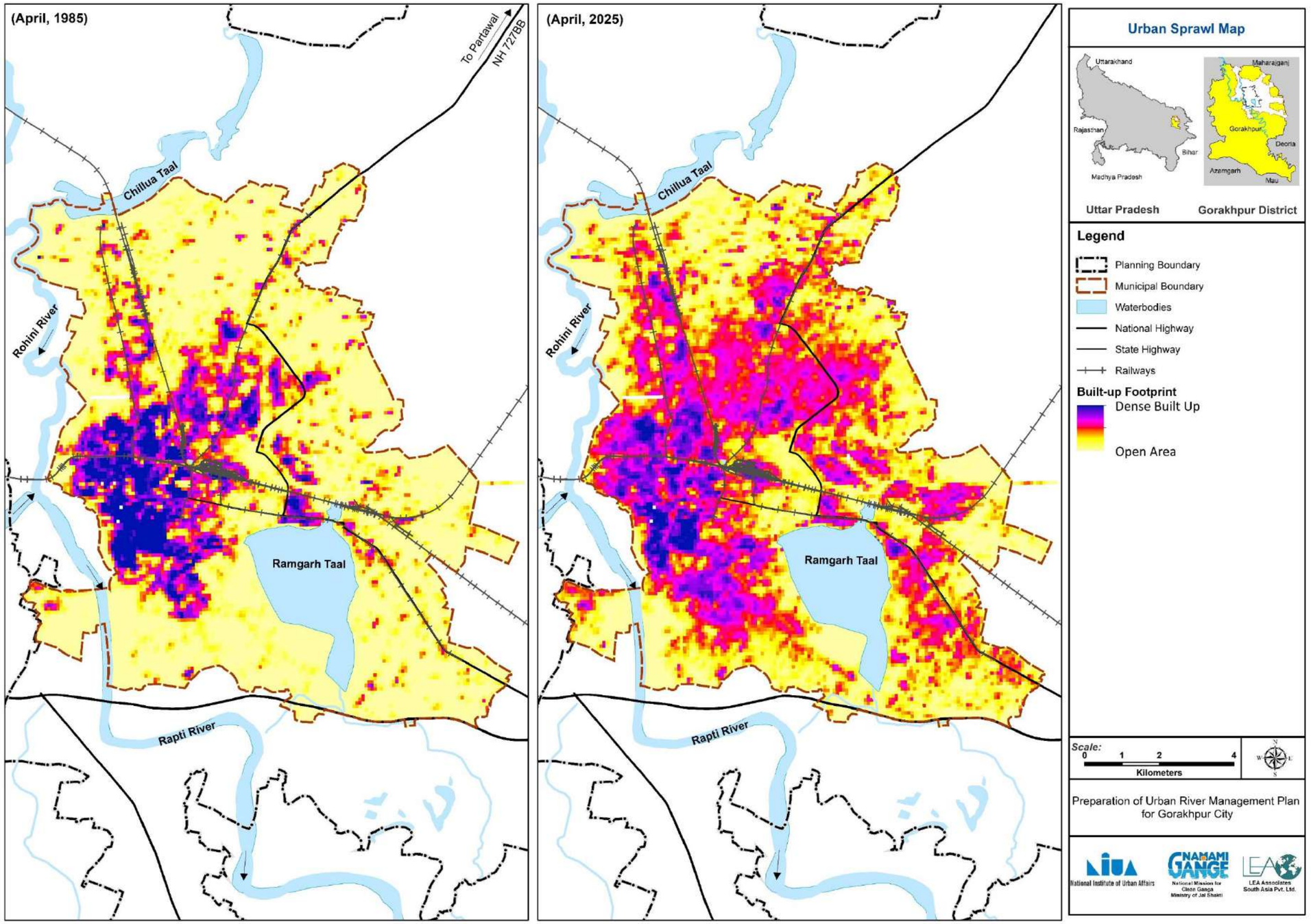


Source: DEM Data (USGS Glovis, Cartosat 1, 30 m Resolution), Consultants Survey

Map 2-4: Elevation map of Gorakhpur city

2.4 Urban Sprawl

The Global Human Settlement Layer (GHSL) spatial analysis highlights a compact, monocentric urban structure to a dispersed, poly-nodal urban fabric across Gorakhpur. In 1985, the built-up footprint was predominantly concentrated within the core city, characterized by compact, high-density, and contiguous development across the central wards. Peripheral areas remained largely rural, with open land and low-density settlements reflecting minimal urban influence. By 2025, the built-up area shows significant radial expansion, with urbanisation spreading across almost all directions, denoting a classical pattern of outward horizontal urban sprawl.



Map 2-5: Urban sprawl in Gorakhpur city

2.5 History and Cultural Profile

- **History**

Gorakhpur originated north of the present town, along an earlier course of the Rapti River. The city is named after the yogi-saint Gorakhnath, whose Nath monastic order has deeply influenced its religious and cultural identity. During the Mughal period, Gorakhpur emerged as an administrative centre under Awadh and is recorded as a sarkar in the Ain-i-Akbari (1595), with a fort along the Rapti River; it was later renamed Muʿazzamabad. Under British rule from 1801, the city gained strategic importance as a garrison town near the Nepal border and became a divisional headquarters in 1829. Gorakhpur played a role in India's freedom struggle, notably during the Chauri Chaura Incident of 1922, and later emerged as a publishing hub with the establishment of Gita Press in 1923.

Mahayogi Gorakhnath Temple

Geeta Press, Gorakhpur

Image 2-1: Important Locations of Gorakhpur City

- **Cultural profile**

Among the major festivals (refer Table 2-1) that bring high number of tourists and pilgrims to Gorakhpur, Makar Sankranti and Chhath Puja are deeply associated with rivers and waterbodies and the other events such as the Gorakhpur Mahotsav, Ram Navami, Janmashtami are particularly significant.

Table 2-1: Festivals and events in Gorakhpur

Festival/Event	Month	Location	Cultural Significance
Makar Sankranti	January	Gorakhnath Temple (near Rohini River, having influence in Rapti River)	Massive pilgrimage; devotees offer khichdi to Guru Gorakhnath (Khichdi Festival); ritual bathing nearby.
Gorakhpur Mahotsav	January (varies)	Gorakhnath Temple & City venues	Cultural showcase of music, crafts and cuisine; draws tourists and locals.
Mahashivratri	February/March (varies)	Temples across city	Devotees visit Shiva temples; not directly river-linked but involves water rituals.
Ram Navami	March/April (Chaitra)	Temples across city	Celebrates birth of Lord Rama; recitations and processions; spiritual gatherings.
Hanuman Jayanti	April	Temples across city	Devotees gather at Hanuman temples; includes water-based rituals.
Buddha Purnima	April/May	Near Ramgarh tal and Buddhist sites	Celebrates birth of Buddha; spiritual events near water bodies.

Festival/Event	Month	Location	Cultural Significance
Janmashtami	August/September	Krishna temples	Midnight celebrations and jhankis; not river-centric but large public participation.
Chhath Puja	October/November	Rapti River, Rohini River, Ramgarh tal Lake, Other Waterbodies	Devotees offer prayers to the Sun God at sunrise/sunset while standing in river water.
Diwali	October/November	Citywide	Festival of lights; not river-linked but includes water rituals in some traditions.

Source – Consultation with the Tourism department, Gorakhpur, 2025

2.6 Tourism Profile

Gorakhpur has a strong cultural, spiritual, and wellness-oriented tourism profile. The tourist footfall pattern reveals a clear dominance of domestic visitors, with foreign tourists below 1% of total arrivals. Between 2017 and 2019, tourism steadily grew from 24.5 lakh to 30.5 lakh. However, the COVID-19 pandemic caused a sharp decline, with arrivals dropping to 14.8 lakh in 2020 and 6.8 lakh in 2021. A recovery began in 2022, reaching 20 lakhs, though still below pre-pandemic levels. The overall trend reflects strong tourism potential, temporarily disrupted by the pandemic.

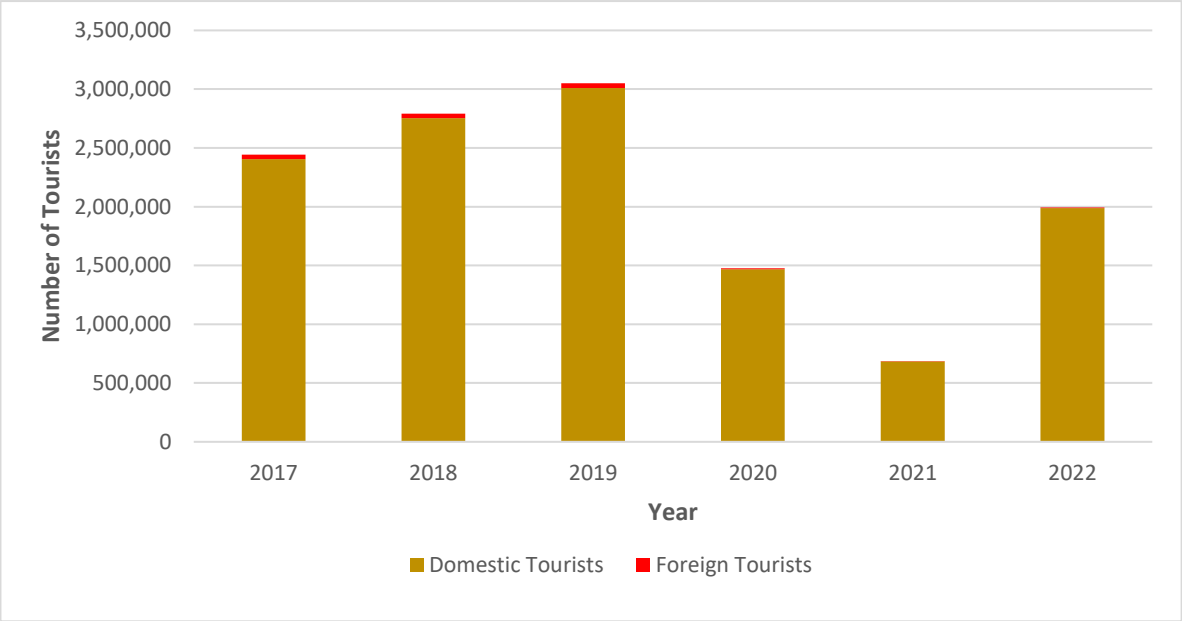


Figure 2-1: Tourist footfall of Gorakhpur

The primary contributors in the tourism in the city are – Shri Gorakhnath temple- The temple is dedicated to the supreme Siddha Guru Gorakhnath, the founder of the Nath sect. Every year, on the occasion of Makar Sankranti, the 'Khichdi Mela' (fair) is organized here, in which lakhs of devotees and tourists visit the temple.

Vishnu temple- The temple has a statue of Lord Vishnu; it was crafted in the 12th century from black touchstone. A traditional Ramlila is organized here on the occasion of Dusshera.

Geeta Press- It features a grand and captivating temple dedicated to Radha-Krishna. A massive number of tourists and devotees flock here during the Shri Krishna Janmashtami festival.

Ramgarh tal- This tal has been developed into a key tourist and recreational destination with government-led beautification efforts. Facilities like boating, cruise services, food courts and landscaped parks along the lake -front attract visitors and support small-scale hospitality businesses, boosting the local economy while preserving the lake's ecological balance.

Source- Annual tourism Statistics, 2024

2.7 Socio – Economic Profile of the City

a. Economic activities along the river-

- **Dhobi ghat (laundry):** Traditional laundry activities take place along the Rohini river near Domingarh bridge, where dhobis use river water for washing clothes.

Image 2-2: Dhobi activity along the Rohini river at Domingarh Bridge

Boating: Informal boating takes place at Ram ghat along the bank of Rapti river. At Ramgarh Tal, GDA regulates boating platforms through tendering and operational standards, ensuring organized management of the activity.

Image 2-3: Boating activity along the Rapti River at Ram Ghat

Image 2-4: Cruise at Ramgarh tal

- **Fishing:** Ramgarh tal has historically supported traditional fishing livelihoods, particularly among local communities such as Nishads and Kewats. The aquatic biodiversity has declined sharply due to urbanization, pollution and encroachment, adversely affecting traditional livelihoods.

At present, fishing is managed jointly by GDA and the Fisheries department, which maintenain the lake and allocates contracts to licensed fishermen. Around 15–20 local fishermen are engaged under these contracts,, catching species such as Rohu, Chinese Rohu and Tangra for sale in local markets. The continuance of this activity highlights the socio-economic relevance of Ramgarh Tal and the

pressing need for ecological restoration and sustainable management to revive biodiversity and support community livelihoods.

Sand Mining: It is not a major economic activity within Gorakhpur city limits. Currently, one sanctioned sand mining operation exists within the GPA, located at Nadwara Lalpur Tikar in Sadar South, along the Rapti River. The mining is operational with environmental clearance granted by the State Environmental Impact Assessment Authority (SEIAA).

Image 2-5: Mining activity at Lalpur Tikar along the Rapti River

River based religious events:

The other events are:

- **Chhath Puja at Rajghat (Guru Gorakhnath Ghat) and Ramghat Ghat:** Every year in October-November, thousands of devotees gather along the banks of the Rapti and Rohini rivers to celebrate Chhath Puja. This large-scale religious gathering reinforces spiritual connection to water bodies but also stimulates the local economy through demand for ritual supplies, food stalls, transport services and temporary infrastructure.

Image 2-6: Chhath Puja in Gorakhpur

- **Dev Deepawali at Ramgarh tal and Rapti Riverfront:** Celebrated around Ramgarh tal and Rapti riverbanks, the event attracts tourists, photographers and locals, transforming the area into a festive marketplace. This celebration significantly boosts hospitality, retail and transport sectors, while promoting the region as a cultural tourism destination.

b. IEC Activities and social engagement:

Currently, there is limited interaction between the public and the river system.

1. IEC Activities of the Gorakhpur Municipal Corporation:

(a) The GMC has created an Information, Education and Communication (IEC) team under Swachh Bharat Mission 2.0 in October 2024 to plan and implement city-wide awareness and engagement activities. The IEC team comprises 52 members from Samvedna Development Society (SDS) and plays a pivotal role in fostering public awareness and participation, particularly on issues of sanitation, waste management and environmental sustainability.

(b) The team collaborates with schools and colleges, Resident Welfare Associations (RWAs), Bulk Waste Generators (BWGs) and religious institutions to execute planned activities. So far, 54 activities have been implemented of which only 2 activities are river-centric.

Image 2-7: International Day of Action for Rivers at Rapti River

Image 2-8: Plog Run for a Cleaner Tomorrow at Rajghat Bridge along the Rapti River

Source: Gorakhpur Municipal Corporation - IEC Team

2. NGO involvements:

Several active NGOs in Gorakhpur, such as the Gorakhpur Environmental Action Group (GEAG) and the Heritage Foundation, contribute to river and ecosystem conservation. GEAG educates communities along the Rapti and Rohini rivers on concepts like "Room for the River" and "Sponge City," empowers Vulnerability Reduction Committees in flood-prone areas to monitor river health, and leads restoration efforts through bio-fencing and desilting of natural drainage channels. Complementing these initiatives, the Heritage Foundation conducts workshops for students and the Nishad community on aquatic biodiversity, organizes campaigns like "Aao Rapti Ko Jane" and the annual Bird Festival at Ramgarh Tal, mobilizes youth through heritage walks, and coordinates post-Chhath clean-up drives along with plantation of native Terai trees to rejuvenate river embankments. Together, these NGOs strengthen Gorakhpur's resilience against flooding while preserving its cultural and ecological heritage

2.8 Institutional Mechanism

The list of existing agencies responsible for planning, development and service delivery within the GPA are presented in Table 2-2.

Table 2-2: Role and responsibility of key government agencies for Gorakhpur City

Sl. No.	Department	Key role and responsibilities	Nodal Officer	Applicable for URMP Objectives
A.	Local Level Agencies			

Sl. No.	Department	Key role and responsibilities	Nodal Officer	Applicable for URMP Objectives
1	GMC	• Area jurisdiction: Municipal Area • Urban services and infrastructure – solid waste management, maintenance of road & drainage, • Environment and public welfare activities • Development and planning • Public interface and emergency services.	Municipal Commissioner	Objective 2, objective 4, objective 5 and objective 9
2	District Administration Gorakhpur	• Maintaining law and order, coordinating civic operations and ensuring regulatory compliance across the city. • Land revenue records	District Magistrate	
2	GDA	• Area jurisdiction: Municipal Area and villages within the Planning Area • Land-use planning, conversion approvals, building permissions etc. • Monitor progress and ensure timely execution of projects using digital tools and MIS systems	Vice-Chairman, GDA	Objective 1, objective 5
3.	Jal Kal	• Responsible for day-to-day operation and maintenance of water supply systems.	Executive Engineer	Objective 2 (Sewerage and water
4.	Local NGO/ Civil Society Member	• Educate local communities on river health, waste management, and conservation practices. • Organize awareness drives, clean-up campaigns, and public meetings. • Promote citizen participation in river protection initiatives. • Lead or support riverbank clean-ups, plantation drives, wetland restoration, and lake rejuvenation activities.	Representative	Objective 10
B.	**Regional/ State level**			
5.	State Mission for Clean Ganga, Uttar Pradesh	• Execute centrally funded projects for sewage treatment, river rejuvenation, drainage management, and ghat development • Ensure timely completion of STPs (Sewage Treatment Plants), I&D (Interception & Diversion) works, and faecal sludge management projects • Oversee construction and beautification of ghats, crematoria, and riverfront amenities to enhance religious and tourism experiences while maintaining sanitation. • Undertake awareness campaigns, school programs, and public outreach to encourage citizen participation in river conservation.	M&E Officer	Objective 2, objective7 and objective 9
6.	Irrigation Department, Gorakhpur Division, Govt.	• Delineate the river flood line and floodplain • Keep record of all floods, identify and mark the maximum flood level recorded or estimated during a major flood.	Executive Engineer	Objective 1

Sl. No.	Department	Key role and responsibilities	Nodal Officer	Applicable for URMP Objectives
	of Uttar Pradesh	• Construct and maintain embankments, spurs, check dams, and undertake anti-erosion works along rivers • Develop watershed projects to conserve soil and water in hilly terrain.		
7.	Forest Department	• Protect forest areas comprising native flora and fauna, endangered species and biodiversity-rich zones.	Divisional Forest Officer	Objective 4, Objective 9
8.	Tourism Development Department, Govt. of U.P.	• Formulate district tourism policies and long-term development strategies • Monitor environmental and social impact of tourism projects • Implement safety protocols and eco-friendly practices	Secretary, Tourism	Objective 8
9.	Pey Jal Nigam, Gorakhpur Division, Uttar Pradesh	• Prepare Detailed Project Reports (DPRs) and execute works for water supply, sewer networks, sewage treatment plants (STPs) and drainage systems in urban and rural areas both. • Implement rural water schemes such as Jal Jivan Mission, • Install chlorination units, UV treatment, or filtration systems in contamination-prone zones	Executive Engineer	Objective 2
10.	Uttar Pradesh, PWD	• Plan, construct and maintain state highways, district roads, rural roads, and bridges.	Executive Engineer	
11.	Town and Country Planning Department, Uttar Pradesh	• Prepare Master Plans and Zonal Development Plans for notified areas	Executive Engineer	Objective 1
12.	Uttar Pradesh Pollution Control Board	• Enforce key environmental acts including: Water (Prevention & Control of Pollution) Act, 1974, Air (Prevention & Control of Pollution) Act, 1981, Environment Protection Act, 1986, Plastic Waste Management Rules, 2016, Biomedical Waste Rules, E-Waste Rules, Solid Waste Rules, etc. • Regularly monitor water quality of the rivers, • Actively support the Namami Gange program through monitoring and enforcement, • Conduct regular inspections of industrial units, hotels, stone crushers, mining sites, etc.	Regional Officer	Objective 2

2.9 Conclusion

The rivers and the ponds of Gorakhpur emerge as critical determinants of the city's ecological resilience, cultural identity, and socio-economic activities. The city's urban morphology is inextricably linked to its hydrological landscape; its saucer-shaped topography and location within the Ghaghra-Gandak Doab have dictated a radial growth pattern while necessitating complex water management strategies for its low-lying depressions and oxbow lakes like Ramgarh Tal. The pressures from urban

expansion, pollution, and encroachment have reduced biodiversity and heightened vulnerability to flooding and waterlogging. This analysis underscores that Gorakhpur's sustainable growth depends on integrated river-centric planning.

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3 ECOLOGICAL PROFILE OF THE CITY

3.1 River Ecosystem

The planning area of Gorakhpur is defined by two major rivers, i.e., Rapti and Rohini, that together shapes the city's landscape. Image 3-1 and Image 3-2 shows the river- city connect in Gorakhpur.

Rapti River- It originates in Nepal and flows through Gorakhpur before merging with Ghaghara River, south of the city. It forms a defining natural edge for Gorakhpur. Within the planning boundary, its length is approximately 27 km, of which approximately 11.6 km is within the Gorakhpur Municipal Corporation (GMC) limits. The river is perennial in nature, but experiences significant seasonal fluctuations and is prone to flooding during monsoon. Its high sediment load and meandering channel have historically influenced Gorakhpur's geomorphology through active bank migration and floodplain aggradation.

The cross-sections of Rapti highlight its dynamic morphology. Near Amrud Mandi (Image 3-3) the river corridor broadens, with vegetated banks, shrubs and a central channel. Zones of siltation, comprising accumulated sand and sediments, gradually merge into the main river. Elevation across this section ranges from about 1 metre below road level at the deepest point to 11 metres above road level in adjoining green areas. Further downstream near Belghat at the Gorakhpur bypass road the corridor widens, featuring two distinct channels separated by a mid-channel sand bar. The eastern floodplain in this stretch is extensively used for agriculture. Channel depth reaches about 1 metre below road level, while the surrounding terrain rises up to 11 metres in adjacent green and agricultural areas.

The cross section of the Rapti river and it its adjoining area reveals a distinct transition between the natural fluvial system on the western side and the urbanized landscape on the eastern side. The river occupies a relatively narrow but well-defined channel. On the western bank, the landform slopes gently from agricultural fields toward the river, forming a natural floodplain zone with evidence of sediment deposition and gradual bank transitions. In contrast, the eastern bank has steep slope toward the urban area (Ward No. 69).

The channel pattern indicates localized meandering and the ongoing interaction between natural river dynamics and human-modified landscapes.

Rohini River- It originates in the Shivalik hills of Kapilvastu and Rupandehi districts in southern Nepal, flows southward into Uttar Pradesh and eventually joins Rapti River west of Gorakhpur. The total length of the river within the planning boundary is about 24.5 kms., of which 10.2 km is flowing along the edge of the municipal boundary. Rohini is a monsoon-dependent tributary. It is highly dynamic, exhibiting active bank migration and floodplain aggradation. Heavy silt loads and seasonal discharge variability have led to significant channel shifts, making the river a critical factor in recurrent flooding patterns. The cross-section near Jangal Gaimara reveals a narrow corridor averaging 30–35 metres in width, bordered by cultivated floodplains that extend up to the embankments. This section is characterized by gentle side slopes and moderate riparian vegetation, reflecting the close interaction between the natural river system and surrounding agricultural landscapes. Within the Gorakhpur Development Authority (GDA) limits, the river connects to Chillua Tal via the Mahesara stream.

The cross section of Rohini river highlights an interface between urban development and the natural fluvial system. The river flows through a narrow channel. On the western side, dense urban settlement (Domingarh) extends close to the river edge, resulting in steeper slope On the eastern side, the terrain transitions from a gently sloping agricultural floodplain into an urban area, reflecting partial retention of natural landforms. Along the banks there are signs of localized erosion and sediment deposition.

Image 3-1: Rapti River

Image 3-2: Rohini River

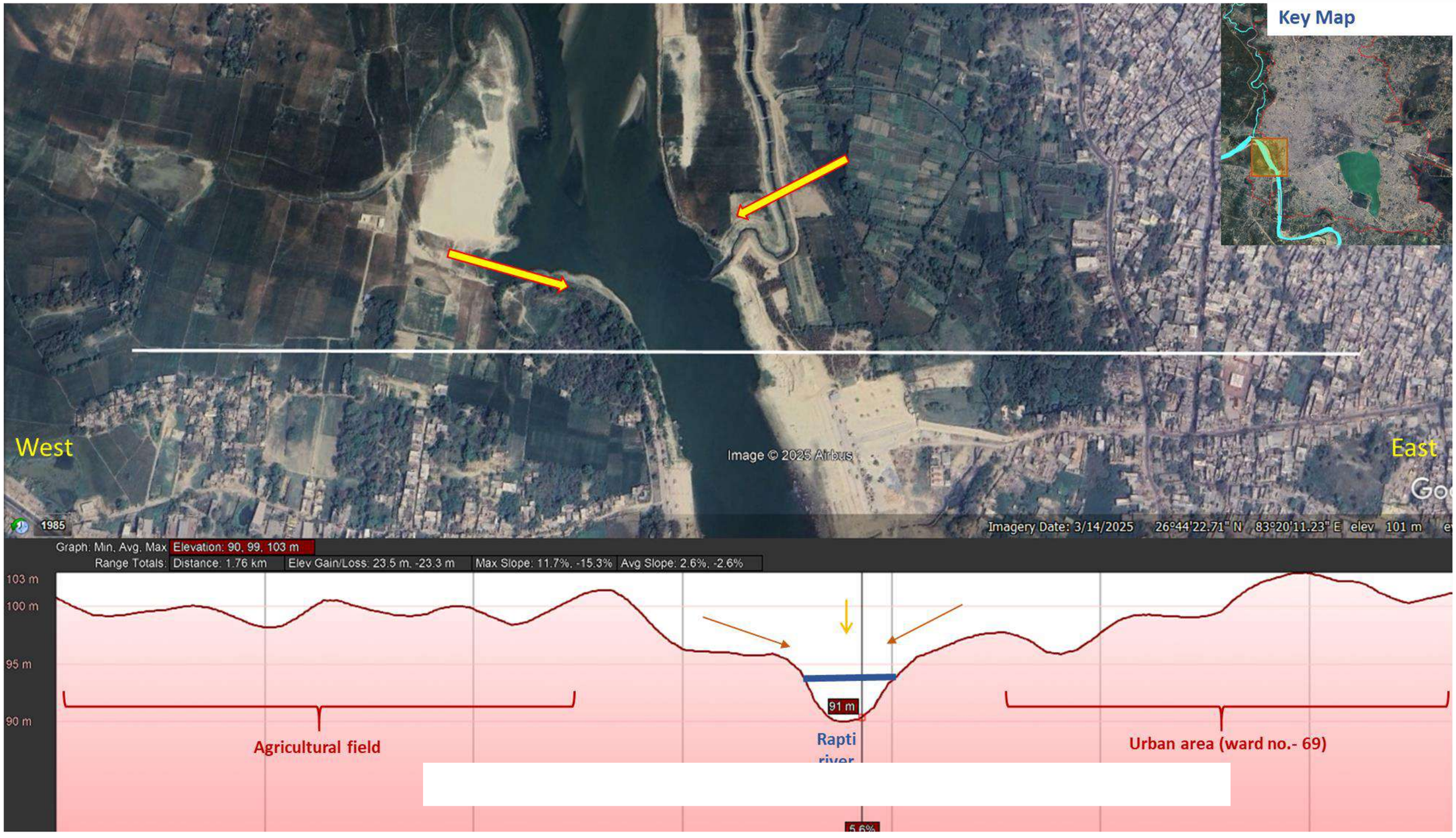

Image 3-3: Cross-Section of Rapti River and its interaction with the city

Image 3-4: Cross-Section of Rohini River and its interaction with the city

3.2 Blue- Green Resources in the city

3.2.1 Blue resources:

Apart from Rapti and Rohini rivers, the Gorakhpur Master Plan 2031 identifies 874 waterbodies and ponds within the planning area of which 178 are wetlands1. Out of these 54 waterbodies having an area more than 1 acre are within the municipal area and 18 of them are notified wetlands. Out of these, Ramgarh tal and Chillua tal are the two major natural lakes. Both lakes are seasonally fed and play a vital role in supporting the region's aquatic ecosystems.

- **Ramgarh Tal:** It is the largest waterbody in the city, located in the south-eastern part of the city. It is a natural oxbow lake, historically formed from an old meander of the Rapti River. The lake spans approximately 723 hectares and has been developed as an urban lakefront. Ramgarh Tal serve as a major hub for fishing as an economic activity and tourism with many facilities like boating, cruise and food courts etc.
- It lies along the northern boundary of the city. It is emerging as another significant recreational destination with lakefront development being undertaken by the Tourism department. The lake has formed in a naturally low-lying area due to water accumulation from local drainage channels, primarily Chillua Nallah and Khurna Nallah. It is a peri-urban waterbody serving multiple functions, including recreation, microclimate regulation and habitat support.

Image 3-5: Ramgarh Tal

Image 3-6: Chillua tal

Out of the waterbodies within the city, 27 were selected for assessment under the URMP framework to evaluate their condition based on six qualitative parameters. The selection of water bodies was cross-checked against surrounding land use patterns to ensure representativeness for DO (Dissolved Oxygen) sampling. The sampling strategy included:

- All water bodies located in flood-prone areas;
- The only water body situated within agricultural land; and
- A spatially distributed selection of water bodies from other land-use categories such as residential, commercial, open green and recreational areas based on their size, proximity and distribution across the city.

The spatial sampling has been designed to ensure uniform geographical distribution based on land use type and location, considering that the overall classification and typology of water bodies across the

1 *Source: Forest Department, Gorakhpur*

city is relatively consistent. Based on the assessment, only 3 water body (refer Map 3-1) have been found to be in an acceptable condition as per the URMP criteria. These water bodies are:

1. Pond near Rohini river
2. Mirzapur lake
3. Khorabar lake

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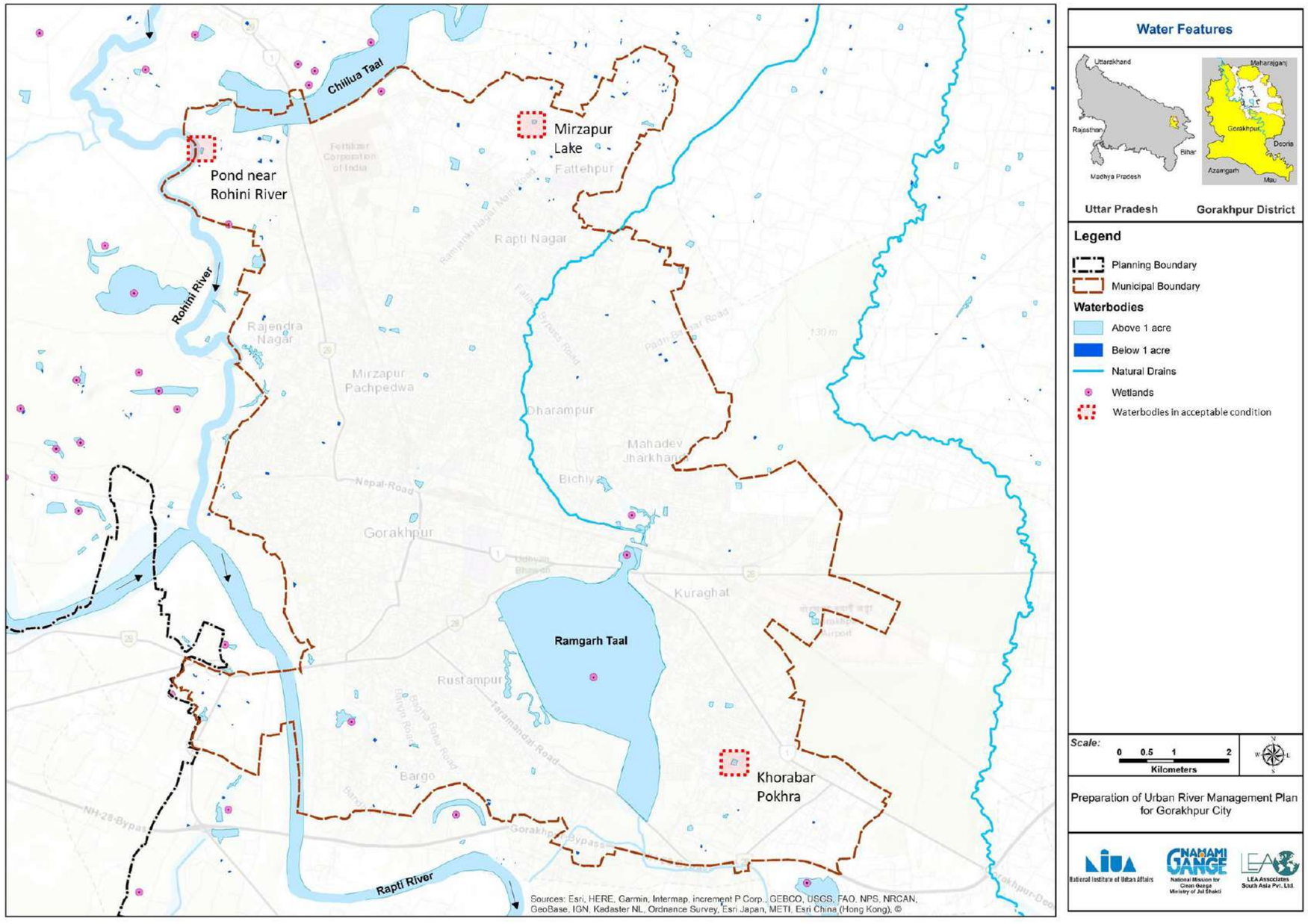

Map 3-1: Water bodies in acceptable condition

3.2.2 Green Resources:

Forest: The Kushmi Forest, located 9 km east of Gorakhpur near Mahayogi Gorakhnath Airport, is a dense Sal-dominated woodland managed within the Tilkonia range of the Gorakhpur Division. Covering 3,207 hectares, it functions as an ecological and recreational green lung and is under consideration for eco-tourism development by state agencies.

Wildlife: Gorakhpur and its environs offer a remarkable blend of urban wildlife management and natural biodiversity corridors. Within city limits, the Gorakhpur Zoological Park serves not only as a wildlife exhibition venue but also as a substantial greenbelt, rescue center and conservation anchor. Outside the urban boundary, Bakhira Bird Sanctuary enriches regional birdlife conservation as a critical wintering ground for migratory species, while Sohagi Barwa Wildlife Sanctuary represents a dense Terai ecosystem supporting tigers, Sarus cranes and numerous threatened species

Urban green belt/ parks- The city currently has a surplus above the 10% minimum green area requirement specified by URDPFI guidelines, 2015. Some of the public parks include Indira Bal Vihar, Gandhi Park and Vikas Nagar Park.

Agriculture- Total agricultural area in the planning area is 79.06 % (Source- Gorakhpur master Plan 2031). Agricultural activities are prominent along the Rapti River in Gorakhpur. Both banks of the river support local livelihoods, with fertile floodplains extensively used for cultivation of crops such as paddy. The stretch near Rajghat, however, is less utilized for agriculture due to urban development and cremation activities. On the other hand, Agricultural activities are widespread along the entire stretch of the Rohini River within Gorakhpur planning area and municipal area Both banks of the river support local farming livelihoods, with fertile floodplains extensively being used for the cultivation of crops such as paddy, wheat, vegetables etc. Agricultural activities are prevalent in areas such as Domingarh, Jangal Harbhajan Singh and Jangal Mehtab Rai.

3.2.3 Riparian Buffer:

The riparian buffer along the Rapti and Rohini rivers exist only on the eastern bank and is shown in below Map 3-2 The river bank is mostly owned by the Irrigation department, GMC and GDA.

Rapti river- The eastern bank has relatively continuous riparian buffers interspersed with urban green spaces and embankments, particularly near Amrud Mandi and adjoining residential areas. These buffers range from 17 to 143 meters in width and include agricultural fields, green belts, and natural vegetation. Field observations indicate three ecological zones: grasses and low herbaceous cover (Zone 1), shrubs (Zone 2), and medium to mature trees (Zone 3). Zone 1 shows signs of fragmentation due to urban activities, especially near Rajiv Nagar Colony, where vegetated areas are being converted into built-up surfaces. In contrast, the western bank is marked by agricultural activities extending into the active floodplain, which reduces the natural flood retention capacity of the riverine landscape.

Rohini river- The eastern bank has a narrow and sparsely developed riparian buffer dominated by Zone 1 vegetation, consisting mainly of grasses and low herbaceous species, with very limited shrub cover and a complete absence of trees. This weak vegetative structure makes the bank more vulnerable to erosion and sediment displacement, particularly during high-flow periods. On the western bank, agricultural fields extend close to the river's edge, encroaching into the active floodplain and disrupting the continuity of the natural buffer, which further increases the risk of bank erosion, especially in downstream reaches near the confluence with the Rapti River

Table 3-1: Assessment of Existing Riparian Buffer within GMC area

Rivers	River Length in Municipal area (in Kms)	Riparian Stretch (in kms)	Current Status	Width range (Meter)
Rapti	11.57	RS -1: 2.5 km	Along the Rapti River is one of the most ecologically intact zones in the municipal area, but it is affected by invasive aquatic species such as Eichhornia crassipes, Pistia stratiotes and Salvinia molesta	17-143 meters
Rohini	10.20	RS -2: 2.29 km	Is characterized by vegetative riparian buffers dominated by native grasses, shrubs and aquatic vegetation, contributing to bank stability and supporting local biodiversity, indicating their ecological significance for river health.	7.5 to 10 meters
				7.5 to 15 meters
		RS – 3: 0.51 km		15 to 30 meters

Source: Consultant's analysis from site observation & satellite imagery

3.2.4 Biodiversity:

The typology of flora and fauna found along the Rapti and Rohini river includes native species like Sal (Shorea robusta), Sheesham (Dalbergia sissoo), Bamboo, and Ficus varieties that stabilize banks and filter runoff. Some common flora species has been listed down below:

Table 3-2: Current Ecological Condition of flora and fauna

Parameter	Rapti River	Rohini River
Riparian Vegetation Composition	Dominated by native grasses, herbs, shrubs, and occasional medium to mature trees such as Ailanthus excelsa (Aaru), Terminalia alata (Asana), Anthocephalus cadamba (Kadamb), and Pongamia pinnata (Kanj). These species support soil conservation, nitrogen fixation, and provide timber, fodder, and fruit. Three vegetation zones are evident: Zone 1 (grasses/herbs), Zone 2 (shrubs), and Zone 3 (trees).	Predominantly native grasses and low herbaceous species with very limited shrub presence and almost no tree cover. Vegetation is largely Zone 1 type, offering minimal ecological buffering.
Buffer Width and Condition	Buffer width varies from 17 to 143 meters. Wider buffers near Amrud Mandi provide better erosion control. Fragmentation is observed near urbanized areas such as Rajiv Nagar Colony due to encroachment by built-up areas.	Narrow and highly fragmented buffer, often less than 30 meters wide due to agricultural expansion. Limited structural vegetation and minimal tree presence constrain the ecological services provided by the buffer.
Faunal Presence	Fauna includes Macaca mulatta (Rhesus Monkey) and Lutra perspicillata (Smooth-coated Otter). Bird species such as Brahminy Kite, Fishing Eagle, Grey Hornbill, and multiple kingfisher species help regulate fish and insect populations. Reptiles including Monitor Lizard, Russell's Viper, and Cobra are also present, contributing to ecological balance.	Presence of common riparian fauna such as kingfishers, egrets, and amphibians has been recorded. Occasional sightings of reptiles like Monitor Lizard and bird species such as herons and kites indicate limited but functional faunal use of the riparian corridor.

Image 3-7: Existing Riparian Stretch along the eastern side of Rapti River

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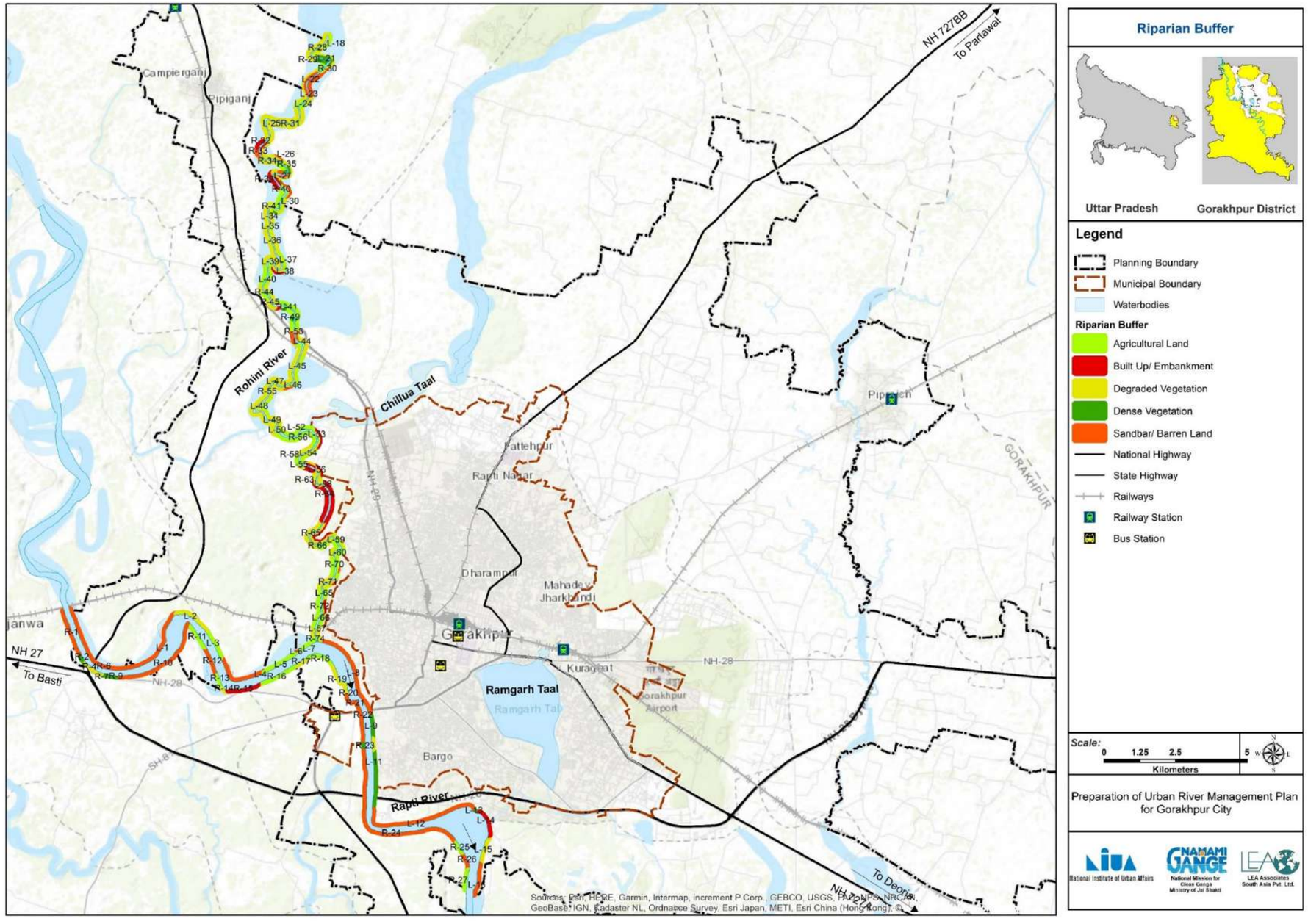


Riparian Buffer

Legend

- Planning Boundary
- Municipal Boundary
- Waterbodies

Riparian Buffer

- Agricultural Land
- Built Up/ Embankment
- Degraded Vegetation
- Dense Vegetation
- Sandbar/ Barren Land
- National Highway
- State Highway
- Railways
- Railway Station
- Bus Station

Scale: 0 1.25 2.5 5 Kilometers

Preparation of Urban River Management Plan for Gorakhpur City

National Institute of Urban Affairs | NAMAMI GANGE National Mission for Clean Ganga Ministry of Jal Shakti | LEA Associates South Asia Pvt. Ltd.

Map 3-2: Riparian stretch within Gorakhpur municipal limit

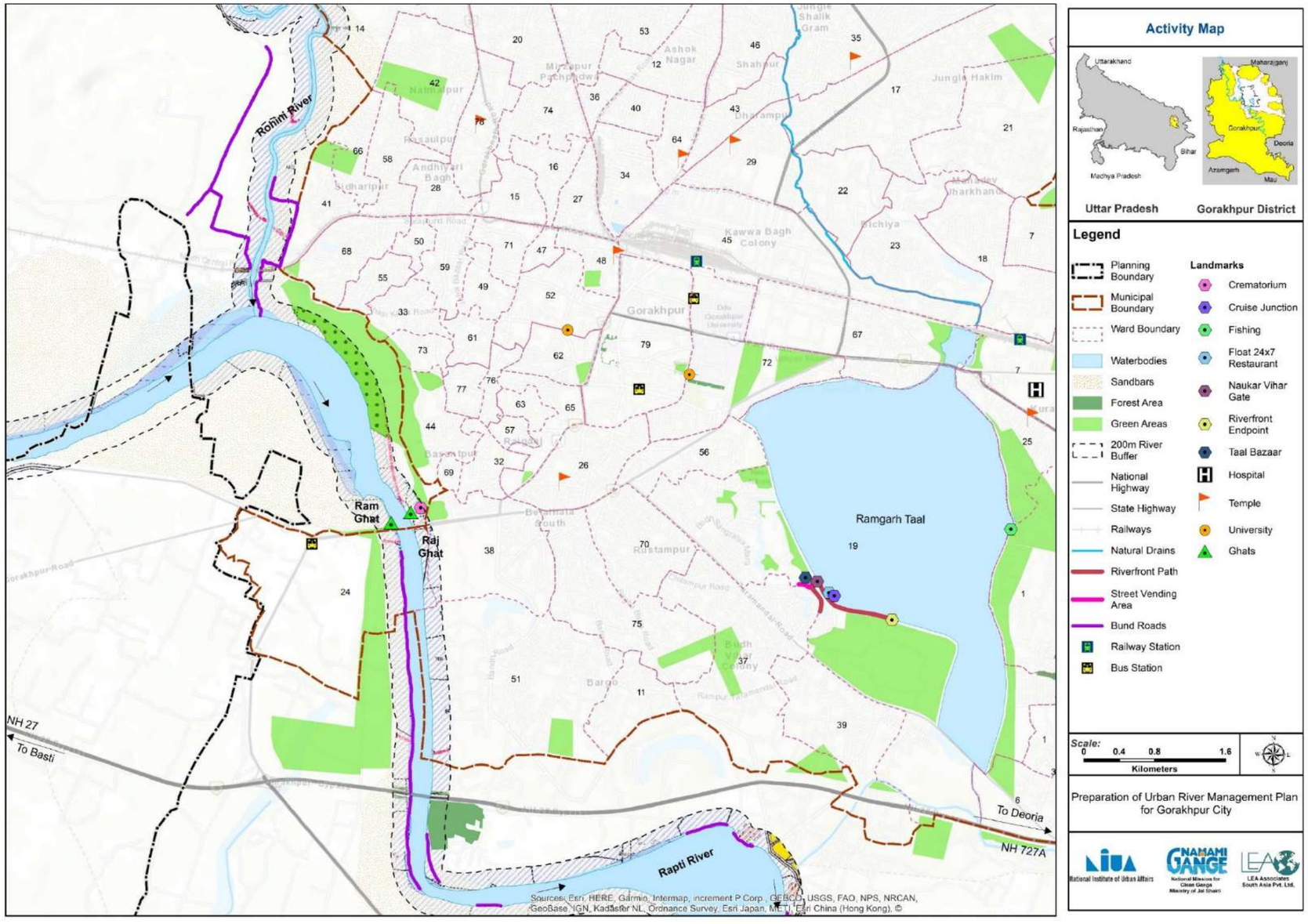
3.2.5 Identified Gaps and Key Degradation Drivers

The riparian buffer along the Rapti and Rohini river is under stress due to the rapid land-use changes. Along the rivers, native tree species have been largely replaced by grasses and shrubs, which lack the deep root systems necessary to stabilize banks against high-velocity monsoon floods. This vulnerability is exacerbated by intensive agriculture along the Rohini, which has systematically narrowed the natural vegetation buffers to maximize crop area. Simultaneously, urban encroachment near the Rapti particularly in areas like Rajghat has allowed residential infrastructure to penetrate natural flood zones, stripping away the river's inherent ability to absorb floodwaters and resist erosion

3.3 Activity mapping along Rivers

The following activities are observed along the Rapti and Rohini river (refer Map 3-3).

1. **Dhobi ghat (laundry):** It is located along the Rohini River at the Domingarh bridge. The activity represents a long-standing informal sector that continues to provide essential laundry services to local neighbourhoods.
2. **Boating Activity**: The activity is performed in the Ramghat and Ramgarh tal. Ramghat is a recreational site and supports small-scale rental businesses whereas boating activities at Ramgarh tal are formally managed by GDA.
3. **Fishing Activity:** Ramgarh Tal has historically sustained traditional fishing livelihoods, particularly among local fisherfolk communities such as the Nishads and Kewats.
4. **Sand Mining:** Gorakhpur has only one sanctioned sand mining operation exists located at Nadwara Lalpur Tikar in Sadar South, along the Rapti River



Source: Masterplan 2031, OSM, Consultant Analysis

Map 3-3: Activity Mapping along Rapti and Rohini Riversand waterbodies

3.4 Flooding

Gorakhpur experiences recurrent seasonal floods and chronic waterlogging, particularly in peri-urban areas for two to three months each year. According to climate change projections, extreme rainfall events are expected to intensify, flood impacts in the city (ISET-International & GEAG, 2014; CDKN Technical Report, 2014).

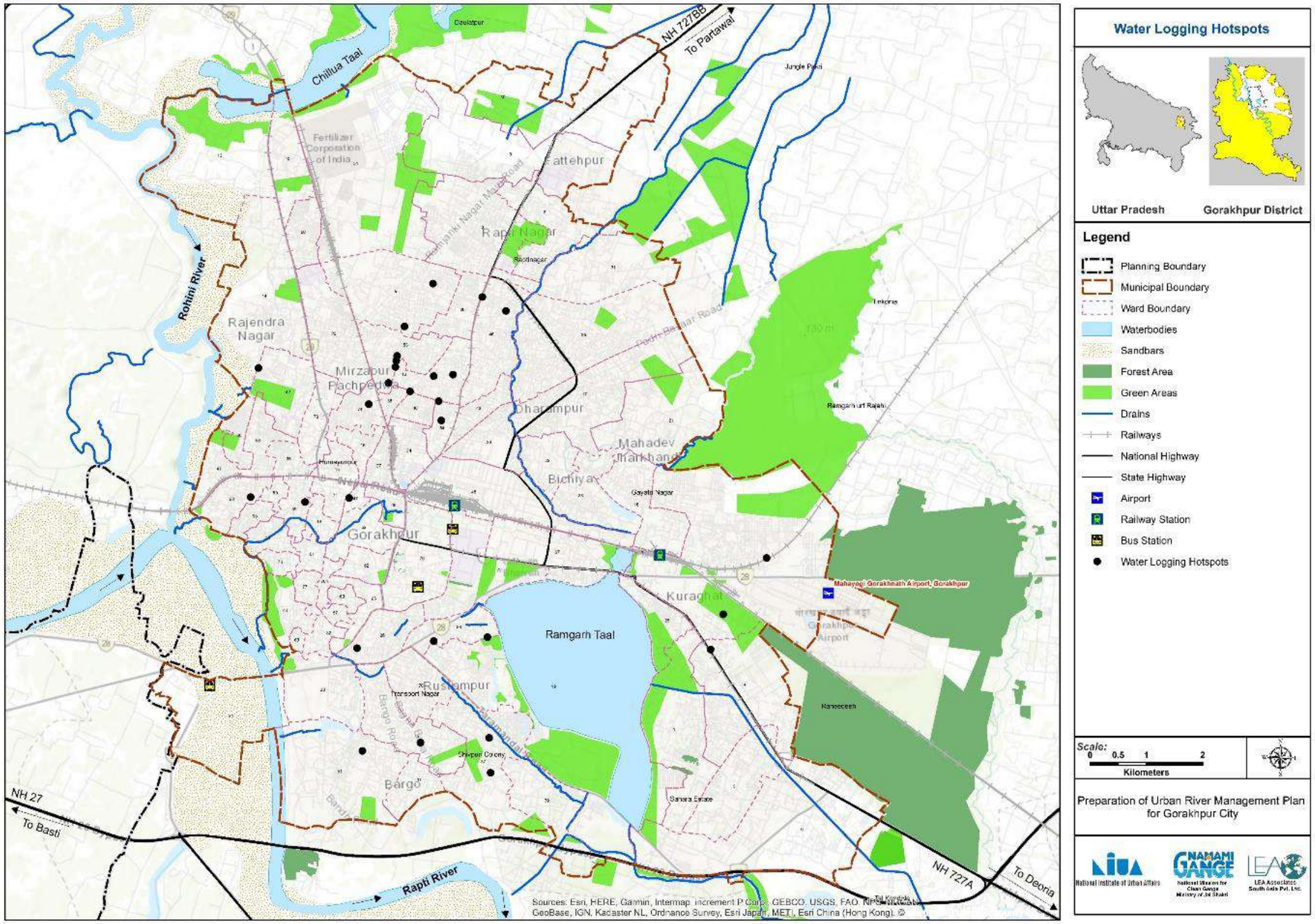
3.4.1 Fluvial Flood Risk

Gorakhpur primarily experiences fluvial flooding, resulting from the overflow of the Rapti and Rohini rivers. The situation turned catastrophic during the 1998 flood, when embankments breached at multiple locations, affecting approximately 1,145 villages, as documented in district records and local reports. In response to this disaster, flood-control measures were reinforced through the construction and strengthening of embankments along the Rohini and Rapti rivers after the 2001 flood. Although flood events recurred in 2001, 2007, and 2009, their severity was significantly lower than that of 1998, indicating the partial effectiveness of the mitigation measures. However, the continued occurrence of floods highlights the persistent flood risk faced by the region. Pluvial Flood Risk

Gorakhpur experiences floods of moderate to high intensity primarily because the city lies in a bowl-shaped lowland, which restricts natural drainage, and due to encroachment on lakes and ponds. The water logging hotspots are given in Map 3-4 To address the issues of pluvial flooding GMC has inaugurated Urban Flood Management Cell (UFMC). Inaugurated Hon'ble Chief Minister Yogi Adityanath in July 2025, it represents a pioneering initiative in India's climate-resilient urban planning. Developed in collaboration with Canarys Automation, this ₹20 crore project is the first of its kind in the country, designed to proactively address the city's chronic urban flooding and waterlogging issues during the monsoon season. The UFMC has implemented automated dewatering systems, GIS-based flood mapping, and real-time performance tracking of drainage infrastructure.

The UFMC aims to transform this vulnerability into resilience by leveraging real-time data, predictive analytics, and automation. These sensors feed data into a centralized dashboard that allows municipal authorities to make informed, timely decisions during extreme weather events.

Image 3-8: UFMC at GMC



Map 3-4: Water Logging Hotspots of Gorakhpur

3.5 Existing/ Upcoming/ proposed Projects

At present, the Forest Department has not initiated or implemented any specific projects focusing on the development of riparian buffer zones along the Rapti and Rohini rivers in Gorakhpur city.

There are ongoing riverfront projects in the city. These are. Chillua Tal is set to receive a new 10-hectare Nath Theme Park dedicated to the Nath sect. The Park will feature mural art depicting the history and stories of the Nath tradition. Alongside the park, the area is being developed as a tourist destination with entertainment facilities and shops, supported by an investment of around ₹20 crore in beautification works. A Bhajan Sandhya venue for devotional music, with a seating capacity of 1,500 people, is also under construction to promote cultural tourism and local employment. This development is expected to boost spiritual tourism and generate new job opportunities in the region. Below pictures showcases the ongoing works undertaken by the Tourism department on Chillua tal.

Image 3-9: Chillua Tal lakefront project

Riverfront development has been proposed along the Rapti River, covering the stretch from Rajghat to Domingarh. The project envisions the beautification and enhancement of the riverfront through landscaping and the creation of recreational amenities. The Gorakhpur Development Authority (GDA) has initiated the process for preparing a Detailed Project Report (DPR) and a financial model. In addition to this the Ekla Bandha site, near Ram Ghat is being developed to serve as a riverfront project, public recreational and ecological space. The proposed infrastructure includes pedestrian pathways, shaded seating areas, sanitation facilities and food amenities, aimed at enhancing public accessibility and environmental aesthetics. This intervention aligns with broader urban renewal and waste-to-resource objectives, promoting sustainable land use and community engagement.

Image 3-10: Ekla Bandha Site proposed for Riverfront Project

GMC aim to rejuvenate identified urban water bodies through measures such as community participation, rainwater harvesting and the development of recreational amenities like walkways and parks near Bhairavpur Pond, Mahadev Jharkhandi Temple, enhancing both ecological health and public engagement. Another example of Moti Pokhra in Ramjanki Nagar, Gorakhpur, once rejuvenated using nano bubble technology and developed for Chhath Puja celebrations, now suffers from neglect and pollution. Despite efforts by the GMC two years ago to clean the lake and improve access, solid and liquid waste has again accumulated, and maintenance has lapsed. The site has become a concern for urban flooding, with rainwater frequently rising to road level, disrupting traffic and posing health risks. Without regular upkeep and waste control, the benefits of the earlier restoration have largely been lost.

Image 3-11: Pond Rejuvenation at Bhairavpur pond, Jharkhandi Mahadev Temple (left) and Pond at Divya Nagar, Ward No 1 (right)

3.6 Institutional Mechanism

The management of riparian zones and riverfront development is a multi-layered undertaking. The forest department oversees the riparian buffer and biodiversity conservation while the municipal corporation responsible for the public amenities, maintenance, and urban integration.

Departments	Role
Irrigation Department	Lead agency for riverbank protection, embankment construction and flood mitigation
Municipal Corporation	Responsible for land regulation, solid waste management and informal settlement control along the riverbanks
Forest Department	Custodian of forested riparian zones and biodiversity conservation
Horticulture Department	Maintains city-level greens, biodiversity parks and zoo; contributes to ecological restoration and landscape management along riparian corridors
Tourism Department	Promotes riverfront development, eco-tourism and cultural heritage zones; supports upkeep of public spaces and amenities along riparian stretches to enhance visitor experience and public engagement

4 PHYSICAL INFRASTRUCTURE

4.1 Water Supply

Gorakhpur's water supply is entirely dependent on groundwater. It is extracted through 320 tube wells within the municipal area. Of these, 173 are large and 147 are mini tube wells.

4.1.1 Water Demand and Supply.

The city is relied on ground water (100%) extraction through GMC borewells. Currently, the city is extracting 214.5 MLD of water daily. However, only 128.7 MLD is effectively supplied to consumers through piped water network, covering about 76.9% of the city., The remaining 85.8 MLD is recorded as non-revenue water (NRW)2, reflecting significant losses in the system.

4.1.2 Water Quality

Water quality plays a crucial role in the health of a river ecosystem. At, present the city conducts manual testing at 2 two points- Rapti river near Domingarh Railway Bridge (after confluence with River Rohini) and Rapti river at Raj ghat. The water quality reports of 2022 and 2023 indicate that the water quality of Rapti River at Domingarh Railway Bridge (after confluence with Rohini River) is comparatively poorer than at Rajghat. The water quality at both the monitoring station has been classified as D (Propagation of Wildlife and Fisheries).

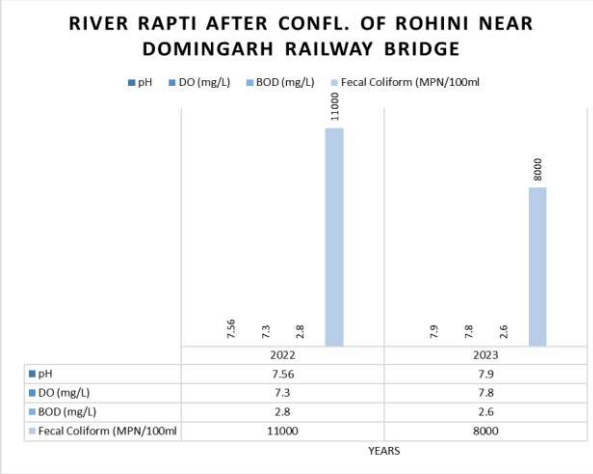


Figure 4-1: Water quality of Rapti river near Domingarh Railway Bridge (after confluence with River Rohini) from 2022 -2023

Source: Central Pollution Control Board

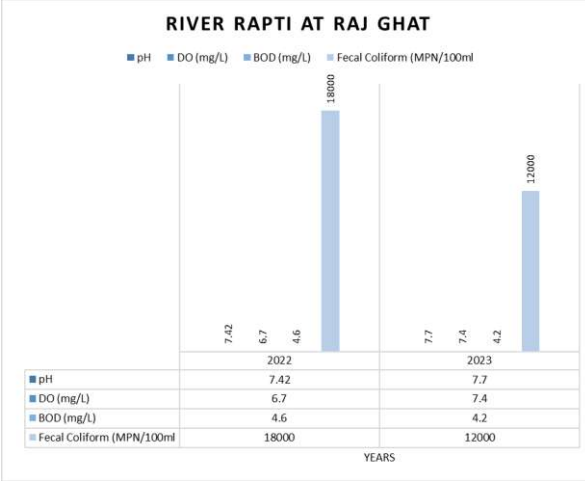


Figure 4-2: Water quality of Rapti river at Raj ghat from 2022 -2023

UPPCB assessments show that pH levels in the Rapti River remain within the permissible range of 6.5–8.5, and Dissolved Oxygen (DO) values are generally above the minimum 5 mg/L, supporting aquatic life. However, Biochemical Oxygen Demand (BOD) and Faecal Coliform (FC) concentrations indicate persistent pollution. At Rajghat, BOD levels often exceed limits, reflecting high organic loading from untreated sewage and effluent discharges, which pose risks of oxygen depletion and biodiversity loss.

2 *Source: Jal Kal Department*

In contrast, Domingarh station records BOD within acceptable limits, suggesting relatively better upstream management.

Rohini River is under greater stress, receiving untreated used water, agricultural runoff and solid waste from densely populated unsewered areas. Field observations and past water quality reports show low DO values (0.8–3.5 mg/L).

Overall, Rapti maintains better water quality than Rohini due to higher dilution and partial sewage treatment coverage, though its downstream stretch near Domingarh shows deterioration from Rohini inflows and urban drains.

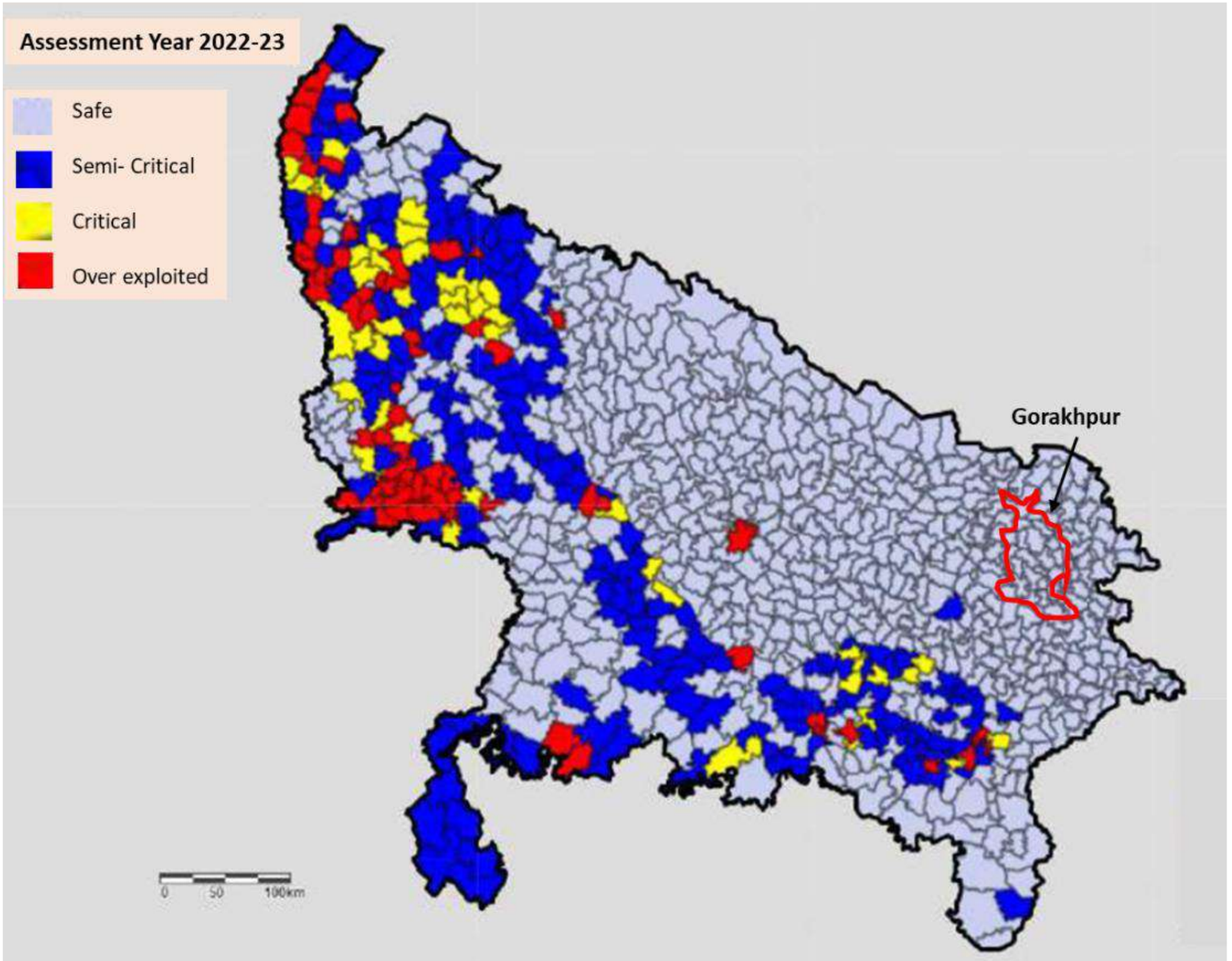
4.1.3 Groundwater

The continuous extraction of groundwater without adequate recharge has led to a steady but alarming decline in water tables, with elevated areas recording drops of nearly 20 meters over the past decade, leading to frequent tube well failures and deeper drilling requirements.

According to Central Ground Water Board (CGWB) data 2021, pre-monsoon levels across the district generally ranged between 2–5 m bgl, with isolated pockets showing deeper levels of 5–10 m bgl in southern blocks like Barhalganj and Gola. Post-monsoon reduced levels to less than 2 m bgl, indicating significant seasonal recovery. Monitoring shows fluctuations of ±2–4 m, with localized variations where abstraction and canal influence alter natural recharge, particularly around Gorakhpur city, Pipraich, and Sadar. Further, as per the National Compilation on Dynamic Ground Water Resources of India, 2023 of CGWB, the Gorakhpur district has been classified under 'Safe 'category with development stage of 63%. The likely reasons for Gorakhpur being in 'Safe' category are as follows:

- Gorakhpur lies in the Tarai–Gangetic alluvial plains, which naturally retain ground water.
- Seasonal flooding of the Rapti River recharges aquifers

Overall, the groundwater scenario in Gorakhpur exhibits favourable recharge conditions and consistent post-monsoon recovery, adequately sustaining both irrigation and domestic requirements. However, increasing dependence on tube wells coupled with urban expansion pose a significant risk of pushing the district towards 'semi critical' category in the near future.



Map 4-1: Depth to water level of Gorakhpur District

4.1.4 Institutional Mechanism

Departments	Role
Jal Kal	Responsible for day-to-day operation and maintenance of water supply systems.

4.2 Sewerage System

4.2.1 Sewage Generation and Coverage

The GMC generates approximately 133.79 MLD of sewage. As per Jal Nigam (Urban), out of total, only 12.4% of the 2,46,647 household households (i.e., 30,629 HHs) are connected to the existing 243 km sewerage network. For operation and management, the city is divided into eight sanitation zones (refer Table 4-1), of which zone A-1 is fully sewered (17,753 HHs), zone C is partially sewered (12,876 HHs) and the remaining 2,16,018 HHs across other zones remain unsewered. Achieving universal coverage will require an additional 2318 km of sewer lines, with expansion plans currently at proposal stage.

These unsewered households, accounting for 87.6% of the total, rely primarily on septic tanks and soak pits for sanitation. Faecal sludge generation from these on-site systems is estimated at 45 KLD

Table 4-1: Present Status of Sewerage Zones in Gorakhpur

S. No.	Zone	Current Status of the Zone	Existing Gaps
1.	Zone A1	20 MLD STP (SBR, 10/30); 173 km sewer line; ~18 MLD flow; ~17,753 connections; nearly full coverage	Greywater from AIIMS nallah discharging into Ramgarh Tal
2.	Zone A2	30 MLD STP (SBR, 10/30) + 50 KLD co-treatment; ~28 MLD flow; no sewer line, greywater tapped from 4 nallahs	High solid waste in drains; STP augmentation & new DPR required
3.	Zone A3	38 MLD STP (SBR, 10/10) under construction (Dec 2026); I&D on 131 drains ongoing	Grey water through Gurdhaiya discharging into Ramgarh Tal,
4.	Zone B	Congested zone; 10 MLD STP (SBR, 10/10) under construction; phytoremediation on Ilahibagh Nallah; 65 MLD STP proposed	solid waste in drains; Phytoremediation needs strengthening.
5.	Zone C	Existing 10 MLD STP (SBR, 10/10); ~9 MLD from sewer (60–70 km, 12,876 connections) + 3 MLD I&D; 30 MLD STP under construction (March 2026)	Solid waste in drains
6.	Zone D	Sparsely populated; HURL ETP discharges into Chillua Tal (DO ~5.3); 25 MLD STP envisaged	No sewerage network; DPR pending
7.	Zone E	Newly added GMC area; 5 MLD STP envisaged	No sewerage network; DPR pending
8.	Zone F	Used water discharged into Gurdhaiya Nallah; interception planned under Zone A3	Additional interception may be needed if flows rise

Source: U.P. Jal Nigam, 2025

4.2.2 Existing Sewage infrastructure

Within the GMC limits, three Sewage Treatment Plants (STPs) are operational with a combined capacity of 60 MLD, all based on Sequential Batch Reactor (SBR) technology. The 10+5 MLD plant

includes secondary treatment along with additional treatment, while the 15 MLD and 30 MLD plants are limited to secondary processes.

Table 4-2: Details of Existing STPs in Gorakhpur

S. No.	Name of STP	Design Capacity (MLD)	Inflow (in MLD)	Status	Pumping Station Details	Current Status
1	20 MLD STP (15+5) at Mahadev Jharkhandi, Gorakhpur	20	13.19 + 0.91 MLD	Operational	20 MLD SPS near RKBK Maruti Showroom, Gorakhpur	Sewage is received by sewer network of 173 km length & 17,753 house connections
2	30 MLD STP at Gorakhpur Zoo	30	22.19 MLD	Operational	30 MLD SPS near Paidleyganj, Gorakhpur	Sewage is received by interception of 4 drains (Paidleyganj Nallah, Golf Ground Nallah, Mohaddipur Powerhouse Nallah, Rafi Ahmad Kidwai School Nallah)
3	10 MLD STP at Subash Chandra Bose Nagar, Gorakhpur	10	8.21 MLD	Operational	40 MLD MPS near Subash Chandra Bose Nagar, Gorakhpur	Sewage is received by sewer network of 69.70 km length & 12,876 house connections

Source: Uttar Pradesh Jal Nigam, Gorakhpur, 2025

30 MLD STP at Gorakhpur Zoo

10 MLD STP at Subash Chandra Bose Nagar

15 MLD STP at Jharkhandi Mahadev

MLD STP at Jharkhandi Mahadev

Industrial Used water: Within the municipal limits HURL fertilizer plant operates its own ETP with treated discharge flowing into Chillua Tal. The DO level at the outfall of HURL plant at Chillua tal of 5.3 mg/l was under acceptable limit.

Onsite sanitation system- GMC is responsible for the collection and conveyance of faecal sludge through a fleet of 24 de-sludging vehicles. These vehicles are primarily deployed in unsewered areas of the city to empty and transport faecal sludge from septic tanks, typically making an average of two trips per day to the treatment facility. GMC has established a 50 KLD co-treatment facility near the Gorakhpur Zoo. This plant is integrated with the existing 30 MLD STP, enabling faecal sludge and municipal sewage to be treated together in a controlled and sustainable manner.

Mobile Faecal Sludge Management (FSM): Jal Kal has deployed a mobile FSM vehicle with a 10,000-liter (10KL) capacity to enhance onsite sanitation services across the city. This specialized vehicle is tasked with collecting and transporting faecal sludge from septic tanks and pit latrines, particularly in areas lacking centralized sewer systems. Its primary disposal point is near Gausahala in the Mahewa Mandi area of Transport Nagar, where the sludge is transferred for safe treatment or containment.

Image 4-1: 50 KLD Co-treatment plant at Gorakhpur Zoo and Mobile FSM Vehicle at Mahewa Mandi

4.2.3 Institutional Mechanism

Departments	Role
Pey Jal Nigam, Gorakhpur Division, Uttar Pradesh	Prepare Detailed Project Reports (DPRs) and execute works for water supply, sewer networks, sewage treatment plants (STPs) and drainage systems in urban and rural areas both

4.3 Storm Water Management/ Drains

The GMC area has a total of 39 major stormwater drains of which 27 are tapped and 12 remain untapped. Among the tapped drains, 16 are connected to the 30 MLD STP, three to the 10 MLD STP and eight to the 20 MLD STP. Of the untapped drains, nine discharge about 49.96 MLD into the Rapti River and three discharges about 15.06 MLD into the Rohini River.

Consultation with Jal Nigam officials revealed that several drains initially linked to the sewerage system were later diverted directly into nearby the water bodies. For example, Gurdhaiya Nalla earlier connected to the 15 MLD + 5 MLD STPs along with seven other drains in Zone A1, was redirected to Ramgarh Tal as a stormwater channel after the new network was laid. Rapid population growth has significantly increased the grey water volumes beyond the capacity of the existing 20 MLD STP, resulting in untreated used water into Ramgarh Tal. Similar capacity shortfalls across other drains contribute to an estimated 24.27 MLD of untreated used water entering local water bodies.

In January 2025, a nature-based solution was introduced at Takiya Ghat (Illahibagh to Rajghat stretch) using bio-remediation and phyto-remediation. Onsite survey data indicated the average Dissolved Oxygen (DO) level is 1.8 mg/L, was well below the permissible limit of 6 mg/L. The situation is further aggravated in Sewerage Zone B, where high population density and limited sewerage coverage lead to substantial untreated domestic used water entering storm drains and discharging

Image 4-17: Takiya Ghat phyto-remediation project

4.3.1 Institutional Mechanism

Departments	Role
Pey Jal Nigam	Drainage and used water services are managed jointly by Jak Kal, UFMC) and UPJN (Urban, Rural). While GMC handles routine maintenance of stormwater drains and sewer lines, UPJN is tasked with the design and implementation of sewerage infrastructure, including sewage treatment plants (STPs). These agencies work under the policy guidance of the State UDD, which provides funding and technical support for urban sanitation projects.

4.4 Solid Waste management

4.4.1 Waste generation, collection and process of conveyance

According to GMC, the city generates approximately 434.6 tonnes of solid waste per day. Of this, about 239.5 tonnes (55.1%) is wet waste, 173.8 tonnes (40.0%) is dry waste, 21.3 tonnes (4.9%) is sanitary and domestic hazardous waste The collection system relies on 238 auto-tippers, each with a capacity of 1.2 MT, deployed for door-to-door collection. To ensure accountability and efficiency, the city employs a GPS-based monitoring system that tracks vehicle movement and collection coverage.

4.4.2 Waste disposal mechanism

There are two Garbage Transfer Stations (GTS) in operation, each with a capacity of 200 tonnes per day (TPD), located at Chargawa (northern part of GMC) and Lal Diggi (southern part of GMC), to facilitate the efficient transfer and further handling of solid waste before final processing.

For dry waste disposal is handled through five Material Recovery Facilities (MRFs) with a total capacity of 190 tonnes per day. Wet waste is managed through twelve decentralized Waste-to-Compost Plants, collectively handling 215 tonnes per day. Domestic hazardous and sanitary waste is currently processed by a third-party contractor, MPCC Khalilabad. Additionally, there is one Construction and Demolition (C&D) Waste Plant in operation with a capacity of 50 tonnes per day.

At present, Gorakhpur's waste processing plants are not operational, and mixed waste is being dumped at a temporary site at Zero Point, Vokta, beside NH-24 in the GIDA area. The site covers about 2 acres and lies only 500 metres from the Rapti River. Waste from the Garbage Transfer Stations (GTS) is transported here using 8 HYVA tippers of 15-tonne capacity each. Legacy waste challenges have already been addressed through the successful remediation of a major dumpsite that earlier contained nearly 196,000 tonnes of accumulated waste from Ekla Bandha near Ram ghat.

Image 4-2: Temporary Dump Site at Zero Point, Sahjanwa, Gorakhpur

- **Issues**

The sections present the key issues currently observed in the city of which adversely affect the river health-

1. **Solid Waste Dumping:** In Gorakhpur, 12 untapped drains directly carry sewage and solid waste into the rivers, contributing significantly to pollution loads. In addition to these, several other drains equipped with screens frequently overflow with accumulated solid waste, allowing debris to enter the river system. Solid waste is frequently dumped by local residents in areas such as Nasirabad, Gasilkatra, Domingarh, Rajghat and Transport Nagar Nallah. This practice obstructs the free flow of drains, increases the risk of waterlogging and flooding and directly contributes to the deterioration of river water quality.

Image 4-3: Solid waste accumulated in drain at Nasirabad, Ghasikatra Rd.

Image 4-4: Solid waste accumulated in Domingarh Drain near Rohini river.

Image 4-5: Solid waste accumulated in drain at Paidleyganj Nallah, SPS

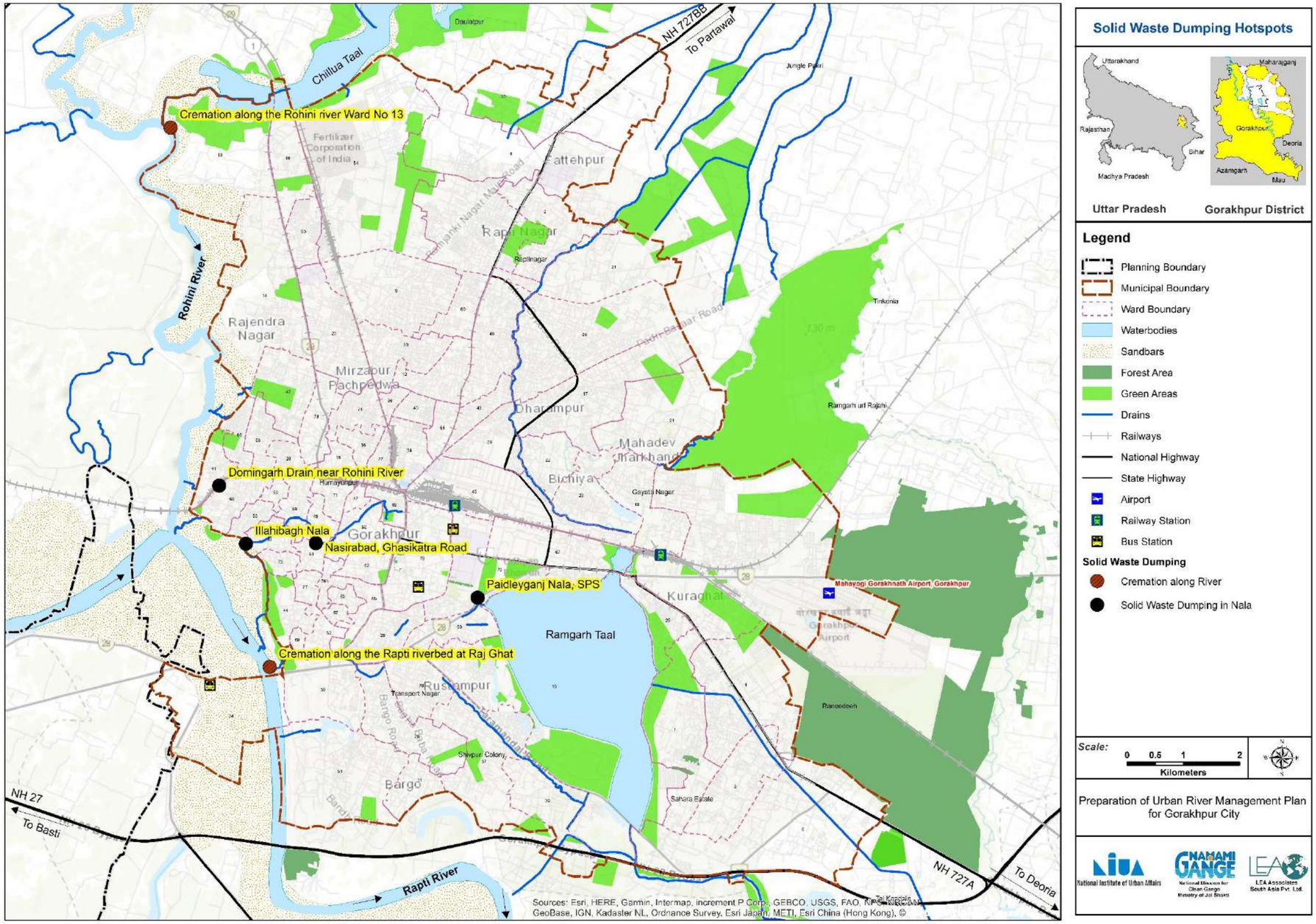
Image 4-6: Solid Waste at Illahibagh Nallah.

Image 4-7: Solid waste dumped along the roads near Rapti river

Image 4-8: Solid waste from the drains dumped along the road

2. **Cremation activities:** Despite the presence of designated cremation facilities such as Ram Dutt Mishra Ghat and Shahara Vaikunta Dham at Raj Ghat, open cremations continue along the Rapti and Rohini riverbeds. The disposal of ash, ritual waste, and partially burnt remains contributes to organic and microbial pollution, aggravating high pollution levels and undermining ecological restoration efforts.

Image 4-9: Cremation along the Rapti riverbed at Raj Ghat (left); Cremation along the Rohini river Ward No 13 (right)



Map 4-2: Solid Waste Dumping Hotspots

Looking forward, GMC plans to remove the legacy waste from Zero point once the NTPC Vidyut Vyapar Nigam (NVVN) Waste-to-Energy Plant at Suthani Village becomes operational. This plant will be operation in November 2025, under a Public-Private Partnership (PPP) arrangement between GMC & NTPC and is set to manage the city's waste through a Waste-to-Charcoal plant, further strengthening sustainable waste management through a circular economy model in Gorakhpur. This will be the country's first Integrated Waste Management Plant under PPP initiative with the NTPC.

The NTPC waste to Energy Plant, spread across 40 acres in Suthni village, Sahjanwa is approximately 10 kms from the east of Rapti river and 25 kms from the city core. It will process various types of waste and generate valuable by-products such as charcoal from dry waste and Bio-CNG from wet waste for ensuring 100% processing of generated waste are ongoing priorities to eliminate reliance on open dumping completely. The details of all proposed initiatives are listed in the table below.

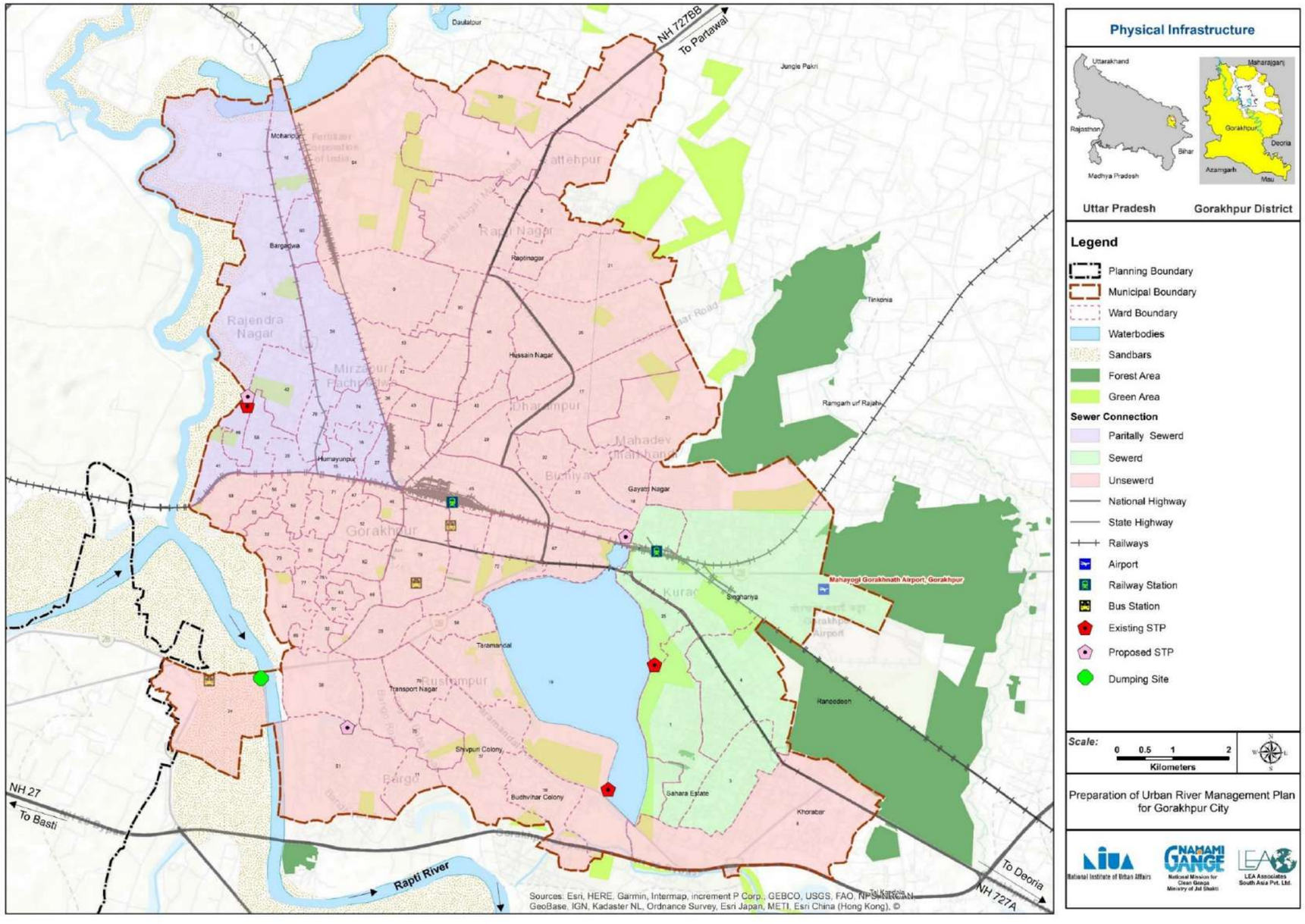
Table 4-3: Proposed Projects for Solid waste Processing Unit

Sl. No.	Waste Processing Units	Description	Capacity	Initiated/Under Installation/Proposed/
1.	NVVN (NTPC Vidyut Vitaran Nigam) for dry waste to charcoal plant.	PPP mode – 350 Cr	500 TPD	Under installation
2.	RNG (Renewable Natural Gas) plant operated by IOCL- Wet Waste to Natural gas	PPP Mode – 285 Cr	200 TPD	Under installation
3.	Domestic Hazard Waste plant is envisaged	-	5 TPD	Under planning/ consideration

Source: Municipal Corporation, Gorakhpur, 2025

4.4.3 Institutional Mechanism

Departments	Role
GMC	Solid waste management is undertaken by GMC which carries out door-to-door waste collection, transportation and disposal along with street sweeping.



Source: Masterplan 2031, OSM, Consultant Analysis

Map 4-3: Physical Infrastructure Map (Gorakhpur)

5 SWOC ANALYSIS AND URM INDEXING OF THE CITY

5.1 SWOC Analysis

Based on the baseline assessment of Gorakhpur city, various issues and gaps have been identified. Based on this, a SWOC analysis has been done and presented below:

STRENGTHS

- Demarcation of "No Development Zone" in flood plains in the Master Plan 2031
- Ongoing embankment protection measures along riverbanks.
- Ongoing construction of 3 STPs with total capacity of 78 MLD, under consideration solid waste management infrastructure (Waste to energy), including Integrated Waste Management Centre.
- Tourism hubs such as Ramgarh Tal support recreation, boating and hospitality activities, thereby boosting the local economy.
- Strong cultural and religious connection with the two rivers supports community engagement and spiritual activities.

WEAKNESS

- Weak enforcement of "No Development Zone" leading to encroachments within flood-prone areas.
- Two-third of sewage (approximately 67%) remains untreated and is directly discharged into rivers and lake, contributing to pollution and ecological degradation.
- Lack of reuse mechanisms for treated used water.
- Challenges in sustaining citizen engagement specifically focused on river-sensitive behaviour and river management activities beyond general sanitation.

OPPORTUNITIES

- Planned expansion of sewage treatment capacity enabling better pollution control and treated water reuse.
- Investments in liquid waste management (Bio products from Water Hyacinth), including the Integrated Waste Management Centre, promote circular economy models and reduce environmental contamination.
- Available treated used water for reuse in non-portable uses.
- Eco-friendly riverfront development of Ekla Bandha Site, Ram Ghat & Raj Ghat, Gurdahiya Nallah presents a chance to embed socio-cultural, economic, environmental sustainability, flood resilience and enhance community spaces.

CHALLENGES

- Persistent pollution from untreated sewage, solid waste dumping in drains, cultural practices like open cremations on riverbeds worsening water quality.
- 100% dependence on groundwater for urban activities, with no treated water resue.

5.2 URM Indexing of the city

The URMP framework provides a clear indexing/ scoring mechanism to monitor progress of project implementation recommended under URMP vis-à-vis its objectives. The implementation of the URMP is monitored through 10 indicators, one for each objective of the URMP framework. The URM_{index} is measured on a scale of one to five, and is useful to paint a snapshot of the situation, which can be used to monitor the implementation of the URMP, and develop overall strategies and policies for enhancement.

In order to understand the present status of water resources in the city, an assessment has been made using the $URM_{index.}$ With a score of 2.1, Gorakhpur is at elementary level of urban river management. This score shall improve upon implementation of proposed interventions against each objective. The figure below shows the current status of the city against each of the objectives of urban river management.

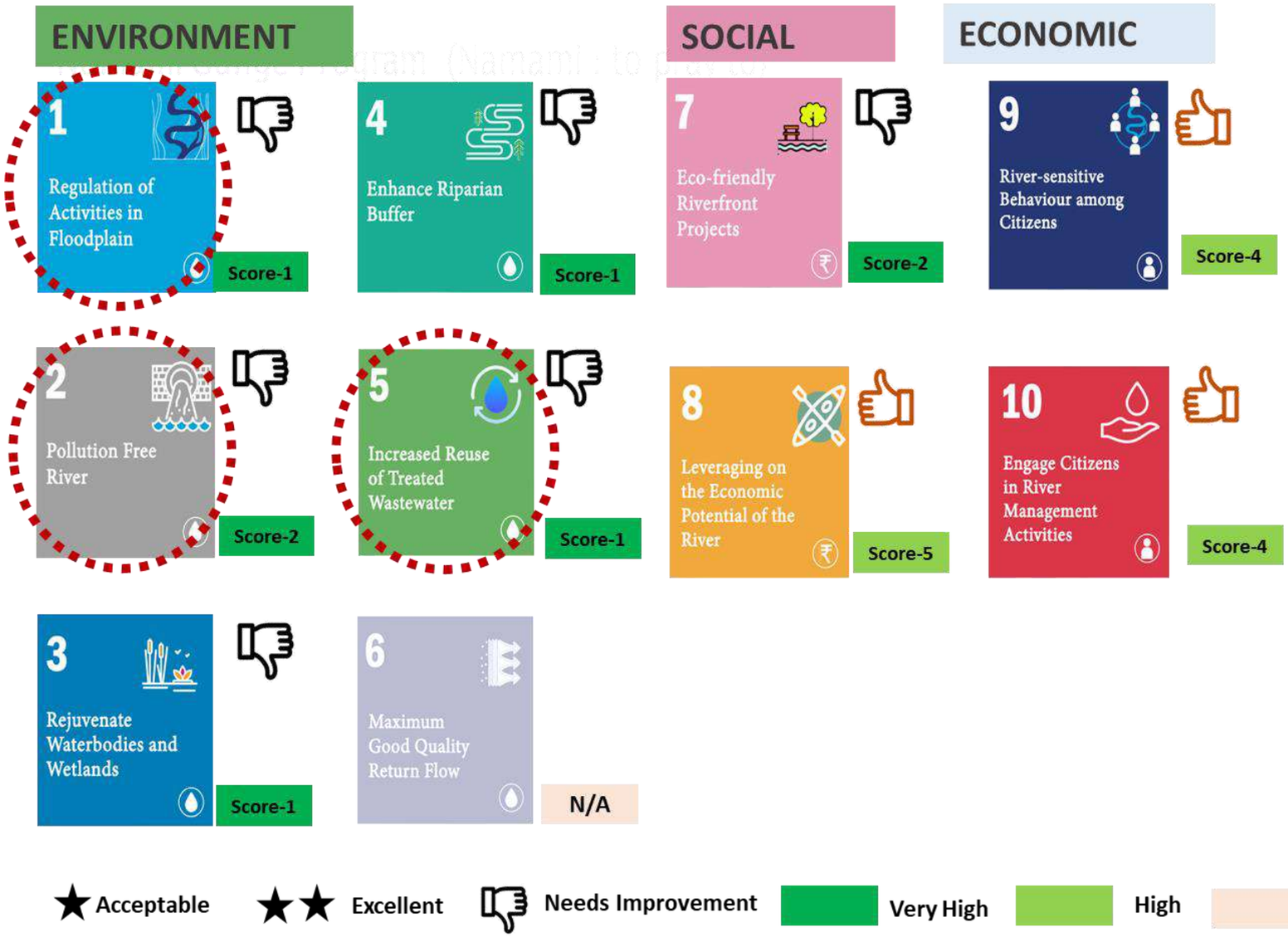


Table 5-1: Prioritization Matrix

6 URMP VISION FOR THE CITY AND ZONING

6.1 URMP Vision for Gorakhpur

The URMP vision for the Gorakhpur is to re-envisioning the city as a river-sensitive sponge city where the Rapti & Rohini rivers and waterbodies function as living systems to build flood resilience, restore ecological balance, celebrate cultural connections, and create inclusive, vibrant riverfronts that enhance the well-being of all citizens.

Gorakhpur's urban form and ecological character are intrinsically shaped by its riverine and wetland systems, notably the Rapti and Rohini rivers, Ramgarh Tal, Chillua Tal, and a network of smaller lakes and drains. These waterbodies have historically supported the city's livelihoods, groundwater recharge, flood moderation and micro-climatic regulation. However, rapid urbanisation, encroachments into floodplains, unregulated used water discharge, and loss of natural buffers have weakened this river city relationship, increasing flood risks, environmental degradation, and public health vulnerabilities.

The preparation of the URMP report for Gorakhpur responds to these emerging challenges by re-positioning rivers and waterbodies as critical urban assets rather than residual spaces. The interventions listed further builds on the baseline assessment to identify strategic, spatially integrated interventions that strengthen flood resilience, restore ecological functions, and support sustainable urban growth alongside of the blue-green infrastructure.

Recognizing Gorakhpur's high flood exposure and waterlogging tendencies, the interventions emphasize nature-based solutions (NbS) such as riparian buffers, wetland restoration, sponge parks, flood-compatible land uses and bio-engineered riverbanks.

The interventions seeks to operationalize climate-resilient, inclusive, and environmentally responsive planning, aligning with the Master Plan 2031, national floodplain zoning principles and river rejuvenation guidelines. By restoring natural hydrological processes and integrating blue-green infrastructure into urban planning, the proposed interventions aim to safeguard communities, reduce disaster risks, and ensure long-term sustainability of Gorakhpur's rivers and waterbodies.

Riverfront Zoning Gorakhpur Municipal Corporation

The Rapti and Rohini rivers pass through areas of very different land use and activity within Gorakhpur. In some locations, the river flows through open floodplains and agricultural land, while in others it is dense settlements, ghats, drains, and embankments. To respond to these variations, the Urban River Management Plan (URMP) divides the river corridor into three homogeneous sections, each with a distinct character, set of challenges, and themes. This approach allows riverfront interventions to be location-specific, flood-safe, and socially appropriate, instead of applying a single design across the entire river stretch.

River Flow Context

- The Rapti–Rohini river system flows from northwest to southeast through Gorakhpur.
- The upstream limit lies near Domingarh, where the Rohini meets the Rapti.
- The downstream limit extends up to the Southern Bypass/Mahewa area, beyond the main urban limits.

Section 1: Eco Confluence Sanjhai (Upstream) to Domingarh Railway Bridge (Rohini–Rapti confluence)

This upstream stretch has natural riverbanks and wide floodplains includes the Domingarh rail bridge, low-density settlements, and agricultural land. Being a confluence zone, it experiences high sedimentation and regular flooding, making it unsuitable for permanent construction.

Proposed Theme: "Ecological Restoration"

Goal: Preserve the natural river edge.

Key Interventions:

- Develop a green buffer with native plants to stabilise riverbanks naturally.
- Use soft landscaping and bio-engineering (such as vetiver or bamboo) instead of concrete walls.

Section 2: Spiritual & Civic Core (Mid-Stream) Railway Bridge to New Road Bridge (Ram Ghat and Raj Ghat area)

This stretch passes through the most densely built part of Gorakhpur, where the river channel is narrow and heavily modified. It includes important religious and civic spaces such as Ram Ghat and Raj Ghat, cremation grounds, and areas with people interacting with the river. Several drains discharge into the river here, affecting water quality.

Proposed Theme: "Socio-Cultural Revitalisation & Pollution Abatement"

Goal: Manage footfall, improve ritual hygiene, and enhance the visual connection between the city and water.

Key Interventions:

West Bank (Ram Ghat)

- Develop a NbS based ghat and riverfront plaza for 'Rapti Aarti' and festivals.
- Create a civic promenade with organised vending areas, parking to prevent encroachment.
- Enhance the phytoremediation project at Takiya ghat, meeting into the river.
- East Bank (Raj Ghat)
- Upgrade cremation facilities into green crematoriums to reduce ash and air pollution.
- Improve access roads to manage festival crowds without spilling onto the riverbank.

Section 3: Resilient Recreation Zone (Downstream) South of Ram Ghat (Ekla Bandha) to Mahewa/Transport Nagar

This downstream stretch is defined by the Ekla Bandha riverfront site designated by GMC on the west bank and wider floodplains on the east. The area includes Nausadh Bridge (Varanasi Expressway), expanding residential areas, and low-lying flood-prone land, and Guava plantation area.

Proposed Theme: "Flood Resilience & Active Recreation"

Goal: A recreational asset having high economic value

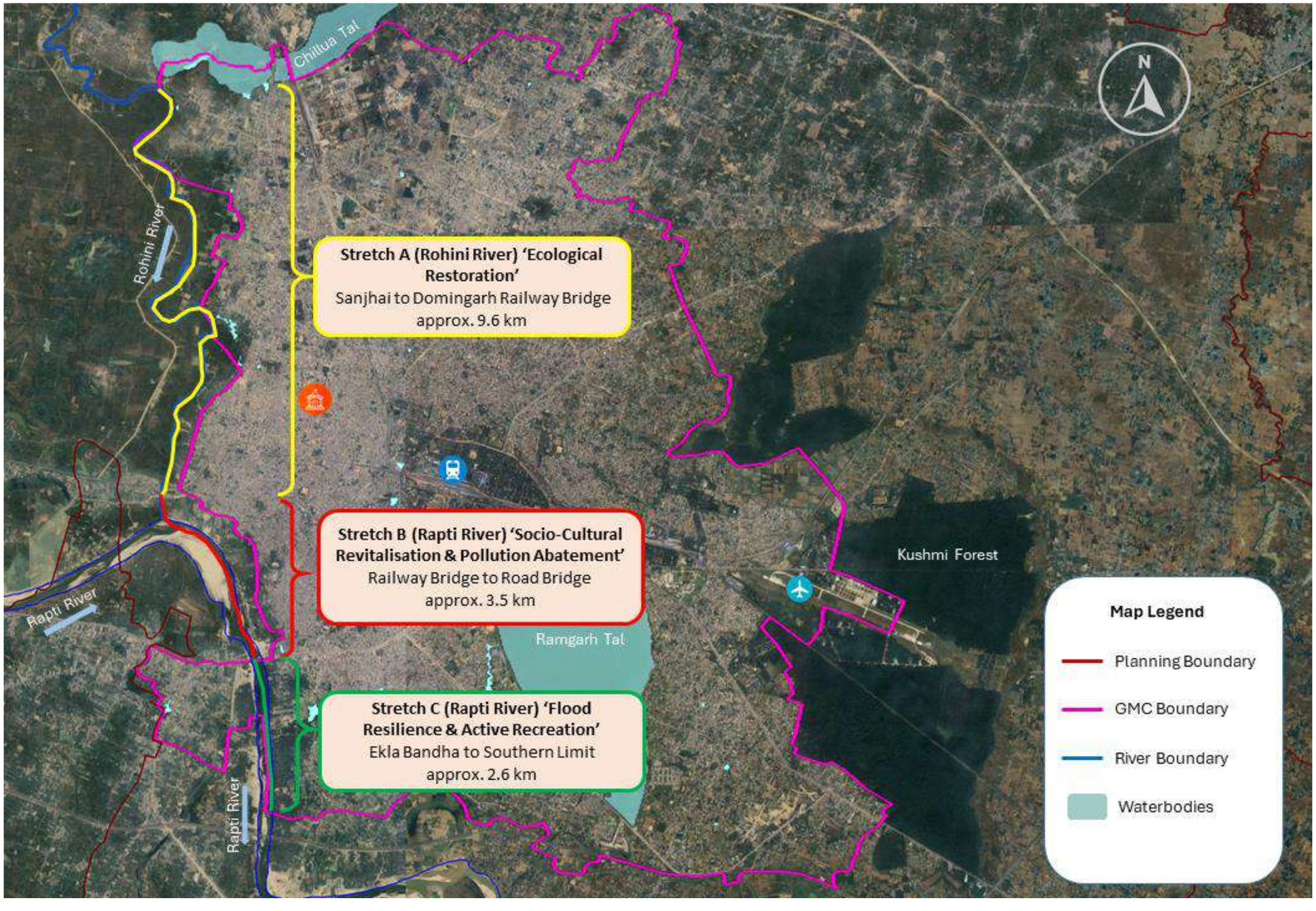
Key Interventions:

- Convert the top of the Ekla Bandha into a linear park, with sponge characteristics, providing safe public access without affecting flood protection and increasing economic potential
- Develop floodable sponge parks on the river side that can safely submerge during monsoon and be used in dry seasons
- Create an urban forest with flood-tolerant trees (such as Arjun and Jamun)

Table 6-1: Stretch-wise Riverfront Zoning Table – Gorakhpur

Section	Location	Theme	Key Intervention
Zone 1	Sanjhai to Domingarh Railway Bridge- 9.6 km	Ecological Restoration	Develop green buffer & soft landscaping
Zone 2	Railway Bridge to Road Bridge -3.5 km	Socio-Cultural Revitalisation & Pollution Abatement	Rapti Aarti Plaza & Green Crematoria at Raj Ghat
Zone 3	Ekla Bandha to Southern Limit – 2.6 km	Flood Resilience & Active Recreation	Linear Park & Floodable Sponge Parks

This zoning framework is aligned with the URMP Gorakhpur vision of developing a resilient, environmentally sustainable, and liveable city. By integrating river management with land-use planning, it strengthens flood resilience, improves urban environmental quality, and promotes nature-based solutions. Simultaneously, it supports cultural continuity and livelihood opportunities without compromising river health, providing a clear spatial framework to guide future investments and regulatory decisions along the Rapti and Rohini river corridors.



Map 6-1: Spatial Division of Rapti and Rohini Rivers in GMC

6.2 Objective 1: Interventions for Regulation of activities in flood plains

Interventions under Objective 1 are intended to strengthen the Master Plan 2031 by embedding flood resilience, ecological restoration and technology-enabled water management into the city's planning framework. In view of Gorakhpur's recurrent flooding within the Rapti–Rohini river system, the interventions emphasize scientific delineation of flood lines using geospatial and hydrological tools, protection of encroachment-free floodplains and conservation of riparian buffers. Nature-based solutions such as sponge parks, permeable landscapes, floodable open spaces, and restored wetlands are proposed to enhance natural water retention, groundwater recharge, adaptive liquid and solid waste management and flood resilience. Integration of real-time monitoring, GIS-based decision support systems and early warning mechanisms will strengthen preparedness and adaptive management. Aligned with national floodplain zoning regulations and climate-resilient urban planning guidelines, these URMP led measures enable a transition from structural flood control to resilient, ecosystem-based planning, ensuring safer communities, protected infrastructure, and sustainable urban growth for Gorakhpur.

6.2.1 Intervention 1: Inclusion and strengthening of provisions in Master Plan of Gorakhpur, 2031

The Master Plan of Gorakhpur, 2031 has the following provisions for river centric planning:

- Provision of River buffer from River Rapti and Rohini. These buffers have been designated as a "No Development Zone".

Gaps in the Gorakhpur Masterplan

The Gorakhpur Master Plan 2031 acknowledges flooding, waterlogging, river corridors, waterbodies and rainwater harvesting as important urban issues. However, it remains largely conceptual and sectoral, lacking spatial precision, ecological design and enforceable regulatory mechanisms. While flood-prone areas and rivers are broadly identified, the Master Plan does not clearly demarcate floodplains, no-development zones or riparian buffers with defined widths, return periods or geo-referenced boundaries. As a result, continued encroachment, inappropriate land use and exposure of vulnerable settlements to flooding remain largely unaddressed.

The Master Plan's approach to stormwater management is primarily reactive and engineering-oriented, focusing on drain widening and desilting without adopting a source-to-outfall framework or integrating water quality considerations. There is no clear strategy for intercepting polluted drains before they enter rivers and wetlands, nor is there a catchment-based approach for protecting Ramgarh Tal, Chillua Tal and associated nallahs. Similarly, rainwater harvesting provisions are largely limited to rooftop systems and do not address area-level runoff management, aquifer recharge or flood mitigation in low-lying wards.

Although rivers and waterbodies are recognized as blue-green assets, the Master Plan does not provide guidance on bio-engineering, riparian restoration or nature-based flood management. The absence of multi-zone riparian buffers, vegetated flood margins and non-structural flood mitigation measures reflects a continued dependence on hard embankments, which offer limited ecological and long-term resilience benefits.

Given Gorakhpur's bowl-shaped topography, high groundwater levels and recurring urban flooding, these gaps make targeted URMP-level recommendations essential. The proposed interventions such

as delineated no-development zones, riparian buffer restoration, integrated drainage and water quality management, and nature-based solutions are critical to translating the Master Plan's intent into implementable, climate-resilient actions that reduce flood risk, improve water quality and restore the ecological functioning of the Rapti & Rohini rivers.

Recommendations for the Masterplan

The following priority interventions are proposed for inclusion in the revised Master Plan 2031:

Table 6-2: Proposed Interventions for Flood and Water Management in Gorakhpur Master Plan 2031

Sl	Intervention Theme	Master Plan Reference	Existing Provision Master Plan	Identified Gaps	Revised URMP-Aligned Intervention	Implementation Mechanism	Expected Outcome
1	Floodplain Delineation & Zoning	Ch. 12 – Blue-Green Infrastructure Sec. 12.3	Broad identification of rivers and flood-prone areas; no return-period based zoning	No flood lines, no risk classification, static NDZ	Delineate 1-in-5, 1-in-25 and 1-in-100 year floodplains using GIS and hydrological modelling and adopt Three-Tier Floodplain Zoning (Zone A, B, C)	Amendment to Land Use Plan & Zoning Regulations; adoption of MoJS/CWC Floodplain Zoning Guidelines 2025	Scientifically defined flood-risk zones and reduced exposure
2	River Management Precinct Overlay	Ch. 10 – Land Use Plan Sec. 10.1 (Proposed Land Use)	Single "Riverfront Development / Green Belt" land-use category	Ambiguous and discretionary development controls	Replace single category with River Management Precinct Overlay subdivided into Zone A, B and C	Modification of Land Use Map & text in Ch. 5	Clear, risk-based land-use regulation along rivers
3	No-Development Zones (High-Risk Floodplains)	Ch. 10 – Land Use Plan Sec. 10.1 (Proposed Land Use) & Ch. 12 – Blue-Green Infrastructure Sec. 12.3	9 m buffer along watercourses; 15 m buffer along major drains	Uniform buffers not linked to flood risk	Declare Zone A as absolute No-Construction Zone; allow only afforestation, wetlands, sponge parks and organic farming	Revised DCR permissibility matrix	Preserved floodways and restored riparian ecology
4	Restricted Use Zones (Moderate Flood Risk)	Ch. 10 – Land Use Plan Sec. 10.1 (Proposed Land Use)	No differentiated controls for flood-prone lands	Inappropriate construction in floodplains	In Zone B, permit only flood-compatible, non-habitable uses; prohibit solid boundary	DCR amendments and enforcement by GDA	Reduced flood damage and obstruction-free floodplains

Sl	Intervention Theme	Master Plan Reference	Existing Provision Master Plan	Identified Gaps	Revised URMP-Aligned Intervention	Implementation Mechanism	Expected Outcome
					walls and permanent structures		
5	Regulated Development Zones (Low Flood Risk)	Ch. 10 – Land Use Plan Sec. 10.1 (Proposed Land Use)	Uniform plinth and height norms irrespective of flood risk	No flood-resilient design standards	In Zone C, mandate minimum FFL = HFL (1998) + freeboard, stilt floors and no basements	Amendments to Building Bye-laws	Flood-resilient built form with lower recovery costs
6	Riparian Buffers & Drainage Channels	Ch. 12 – Blue-Green Infrastructure Sec. 12.3	9–30 m buffer mentioned without ecological design	No multi-zone riparian buffer or bio-engineering guidance	Introduce multi-zone riparian buffers and treat feeder drains as extensions of floodplains	Environmental regulations and zoning overlay	Improved river health and reduced bank erosion
7	Protection of Waterbodies & Wetlands	Ch. 12 – Blue-Green Infrastructure Sec. 12.3	Ramgarh Tal eco-sensitive zone; no city-wide inventory	Lack of baseline data and catchment integration	Conduct baseline inventory, hydrological & ecological assessment of all waterbodies; integrate findings into zoning	Integration with Master Plan & ICCC	Enhanced flood detention and biodiversity conservation
8	Rainwater Harvesting & Runoff Management	Ch. 11 Zoning Regulations Sec. 11.6	Mandatory rooftop RWH for large plots	No area-level runoff or flood mitigation focus	Strengthen RWH through recharge pits, bioswales and permeable landscapes in flood-adjacent wards	Building Bye-laws & Open Space Guidelines	Reduced runoff and improved groundwater recharge
9	Monitoring & Adaptive Flood Management	–	No floodplain-specific monitoring framework	Static planning and weak enforcement	Establish GIS-based floodplain monitoring, 5-year review of flood lines and zoning	URMP–ICCC integration	Adaptive, climate-resilient river management

6.2.2 Intervention 2: Relocation of Un-authorized Settlements in Floodplains

The eastern and south-eastern parts of Gorakhpur, particularly the areas of Domingarh and Amrud Mandi are located within the active floodplains of the Rapti River and are chronically exposed to riverine flooding, prolonged waterlogging and backflow conditions during the monsoon season. These areas fall within low-lying zones with limited natural drainage gradients and are directly influenced by seasonal rise in river water levels and groundwater table as shown in Map.

Over time, unauthorised settlements have emerged in floodplain areas due to low land prices, proximity to jobs and weak land-use enforcement. Their location in flood-prone zones poses serious risks to life, property and public health, as seasonal flooding damages houses, contaminates water sources, disrupts sanitation and increases disease vulnerability. These settlements also obstruct natural flow paths and reduce flood storage, worsening flooding in surrounding urban areas.

Phased Relocation and Rehabilitation

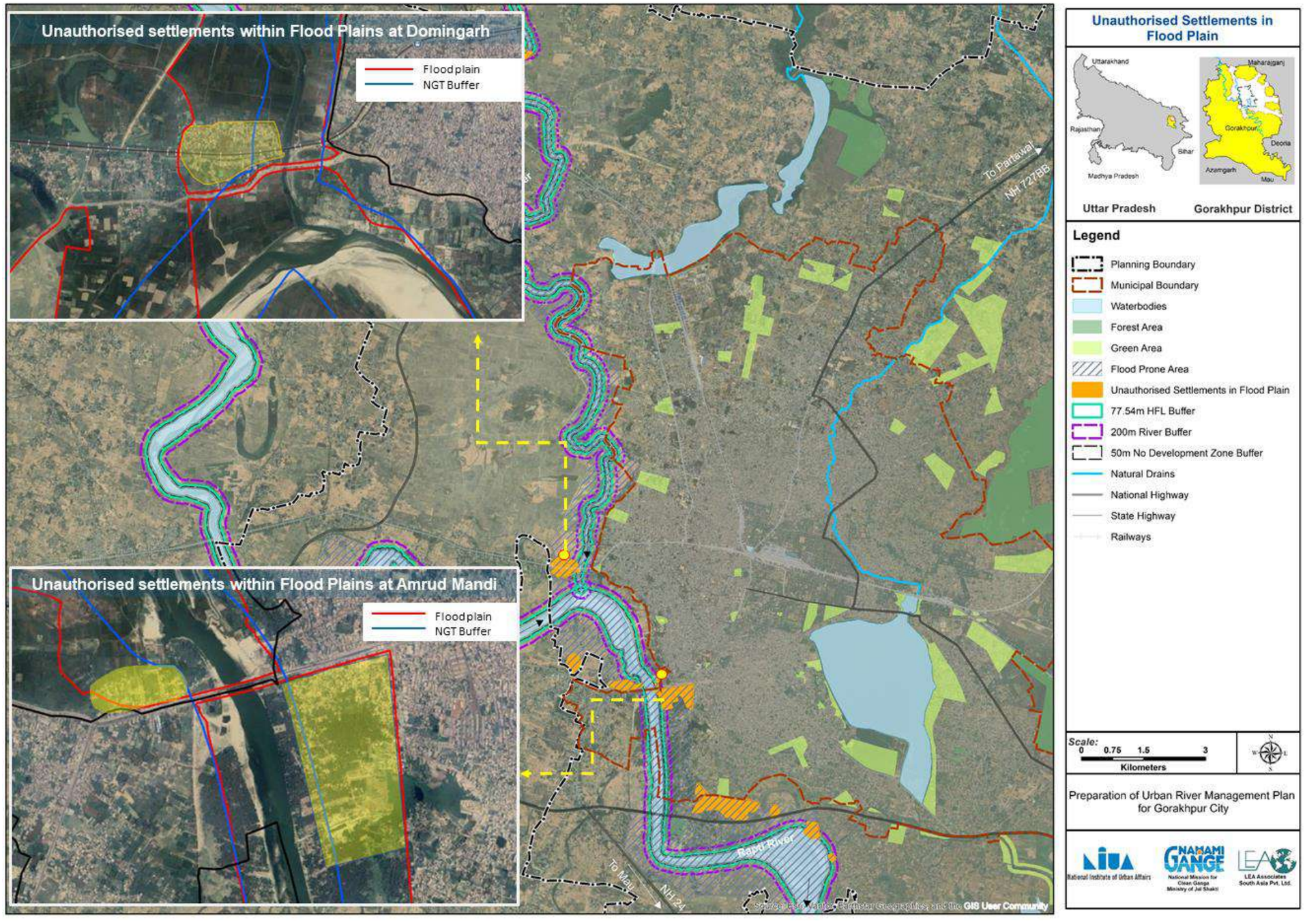
Relocation shall be implemented in a phased manner to minimise disruption and ensure institutional preparedness. A detailed socio-economic and household survey has to be conducted prior to relocation to identify affected families, including registration of the name of the head of household and the number of household members. Identified households shall be rehabilitated at suitable sites located outside the floodplain, with access to basic urban infrastructure such as water supply, sanitation, electricity, road connectivity, schools and health facilities. Rehabilitation shall preferably be undertaken through existing housing programmes such as PMAY (Urban), affordable housing projects or state-supported resettlement schemes.

Where feasible, relocation sites shall be located within reasonable proximity to existing livelihood sources to reduce income loss and social dislocation. Transitional support, including shifting assistance and temporary rental support, shall be provided during the relocation period as per the RFCT-LARR 2013.

Restoration of Vacated Floodplain Areas

Following relocation, the vacated areas in Domingarh and Amrud Mandi shall be restored as floodplain buffer zones. These areas shall be regraded and landscaped to function as flood retention basins, seasonal wetlands and green buffers that enhance the river's natural flood management capacity. Native vegetation provided in Objective 4 shall be planted to stabilize soils, reduce flooding, improve ecological connectivity and prevent re-encroachment.

Permanent construction within these restored floodplain areas shall be strictly prohibited and clear demarcation, fencing and monitoring mechanisms shall be put in place to ensure long-term protection as described in the interventions of Objective 4.



Map 6-2: Map showcasing the settlements falling within the Flood Prone Area in Gorakhpur

6.3 Objective 2 Interventions to keep river free from pollution

Interventions under Objective 2 comprise measures to keep the Rapti & Rohini River, its tributaries and the Nallahs flowing into the river and Ramgarh Tal free from liquid and solid waste pollution. Major source of liquid waste pollution at Gorakhpur is from raw sewage disposed of into drains from houses. Similarly, disposal of municipal solid waste into streams and drains form high dense areas is a major cause of solid waste pollution.

6.3.1 Intervention 3: Construction of I&D structure at AIIMS Nallah at RKBK

Stormwater pipeline originating from the AIIMS side currently discharges directly into Ramgarh Tal, a critical urban waterbody of Gorakhpur with significant ecological, hydrological and cultural importance. Field observations and water quality monitoring indicate that the discharge entering Ramgarh Tal through this pipeline carries substantial dry-weather sewage and greywater load, as evidenced by the low dissolved oxygen (DO) level of approximately 1.8 mg/L at the discharge point. This value is well below the desirable threshold for supporting aquatic life and reflects severe organic pollution. **Map 6-3** below shows the location of AIIMS Nallah and the RKBK SPS.

Proposed Intervention

It is proposed to implement an Interception and Diversion (I&D) system for the 1600 mm diameter stormwater pipeline from the AIIMS side and divert the intercepted flow to the inlet sump of the RKBK pumping station, from where it will be conveyed to the 15 + 5 MLD Sewage Treatment Plant (STP) at Jharkhand Mahadev for treatment (refer **Map 6-3).**

An interception structure shall be constructed at a suitable upstream location along the 1600 mm pipeline, prior to its outfall into Ramgarh Tal. The interceptor shall be designed to capture dry-weather flows and low-intensity runoff carrying high pollutant loads, while allowing excess stormwater to bypass safely during peak rainfall events. The intercepted flow shall be diverted through a dedicated conveyance system to the inlet sump of the RKBK pumping station. Hydraulic design shall ensure compatibility with the existing pumping capacity and operating regime of the station. Adequate provisions for screening and grit removal shall be incorporated to protect pumps and downstream infrastructure from debris and sediment. The flow arrangement is presented in **Figure 6-1** and the conceptual arrangement of the I&D components is presented in **Figure 6-2.**

Figure 6-1: Flow arrangement of proposed I&D Structure

Map 6-3: Location of untapped AIIMS Nallah flowing into the Ramgarh Tal

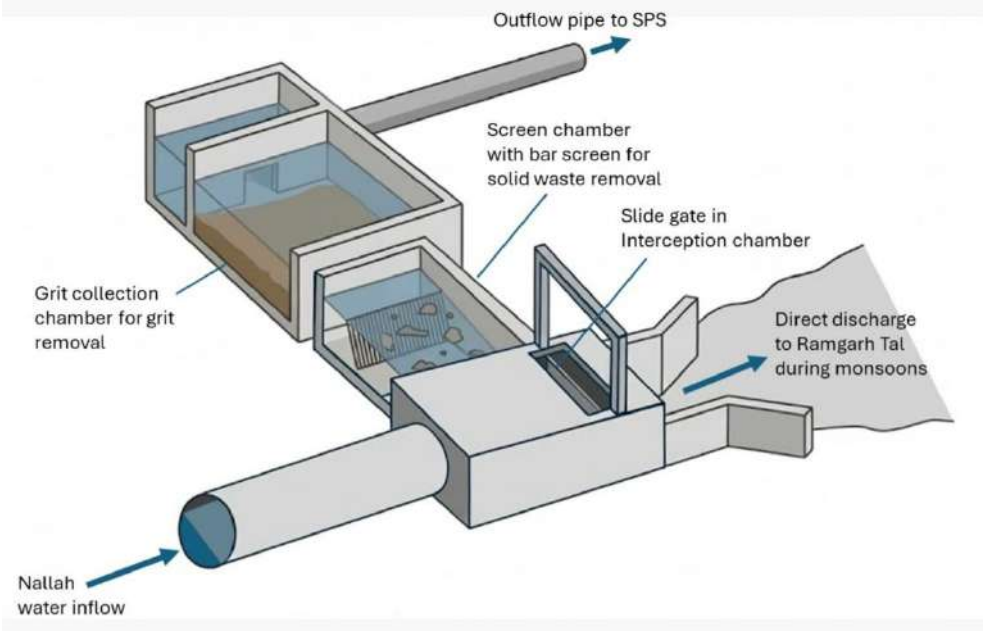


Figure 6-2: Conceptual arrangement of proposed I&D components

Implementation Framework:

Responsible agency: Jal Nigam Urban	**Estimated budget:** ₹2 Cr
Timeline: Short term 9-12 months	**Funding sources:** AMRUT, NMCG

6.3.2 Intervention 4: Removal of solid waste from the drain through litter trap

Urban drains in Gorakhpur carry not only stormwater but also significant quantities of floating solid waste, including plastics, packaging material and organic debris, originating from dense residential, commercial and institutional catchments. During dry-weather flows and especially during monsoon events, accumulated litter is transported downstream, leading to pollution of receiving waterbodies, operational issues in pumping stations and obstruction of interception and diversion (I&D) systems.

In line with the Urban River Management Plan (URMP) objective of preventing solid waste entry into rivers and protecting downstream used water infrastructure, rise-type litter traps are proposed at strategically important locations where floating waste can be intercepted effectively before entering sensitive systems.

The two identified locations where major solid waste flows through the drains area:

- Ilahibagh Nallah near the Storm Water Pumping Station, and
- Paidleganj Nallah at Buddha Gate, upstream of the I&D system at Paidleganj.

Proposed Intervention:

It is proposed to install riser type litter collection systems at both locations. These systems are designed to intercept floating solid waste while automatically adjusting to variations in water levels, thereby ensuring uninterrupted performance during both dry-weather conditions and high-flow monsoon events.

The rise-type mechanism allows the litter trap to move vertically with changing water levels, maintaining interception efficiency without causing flow obstruction or backwater effects. Floating waste captured by the system shall be guided towards designated collection points along the drain bank for safe and regular removal.

Image 6-1: Solid waste accumulation at Ilahibagh Nallah

Image 6-2: Solid waste accumulation at Paidleganj Nallah at Buddha Gate

Figure 6-3: Conceptual arrangement of proposed Litter Trap

Implementation Framework:

Responsible agency: Jal Nigam Urban	**Estimated budget:** ₹0.95 cr each ~ ₹1.9 cr
Timeline: Short term 6-9 months	**Funding sources:** AMRUT, NMCG

6.3.3 Intervention 5: Strengthening of faecal sludge treatment facilities in the city"

Gorakhpur's sanitation system comprises a combination of sewered, partially sewered and unsewered areas, with a substantial proportion of household's dependent on on-site sanitation systems such as septic tanks. While several sewage treatments plants (STPs) are operational or proposed across different sewerage zones, the management of faecal sludge generated from on-site systems remains a critical gap.

At present, faecal sludge treatment capacity within the city is limited and spatially constrained, resulting in long haul distances for desludging vehicles and increasing the risk of unsafe disposal practices. Existing STPs are primarily designed to treat municipal sewage and are not uniformly equipped to handle septage loading without adversely affecting process performance. To address these challenges, dedicated co-treatment facilities integrated with existing STPs are proposed in key sewerage zones.

Presently, faecal sludge collected from septic tanks by the desludging vehicles is directly discharged in 50 KLD Co treatment plant near Gorakhpur Zoo at southern edge of the Ramgarh Tal in the premises of the 30 MLD STP. GMC also has a mobile FSM vehicle for desludging at site.

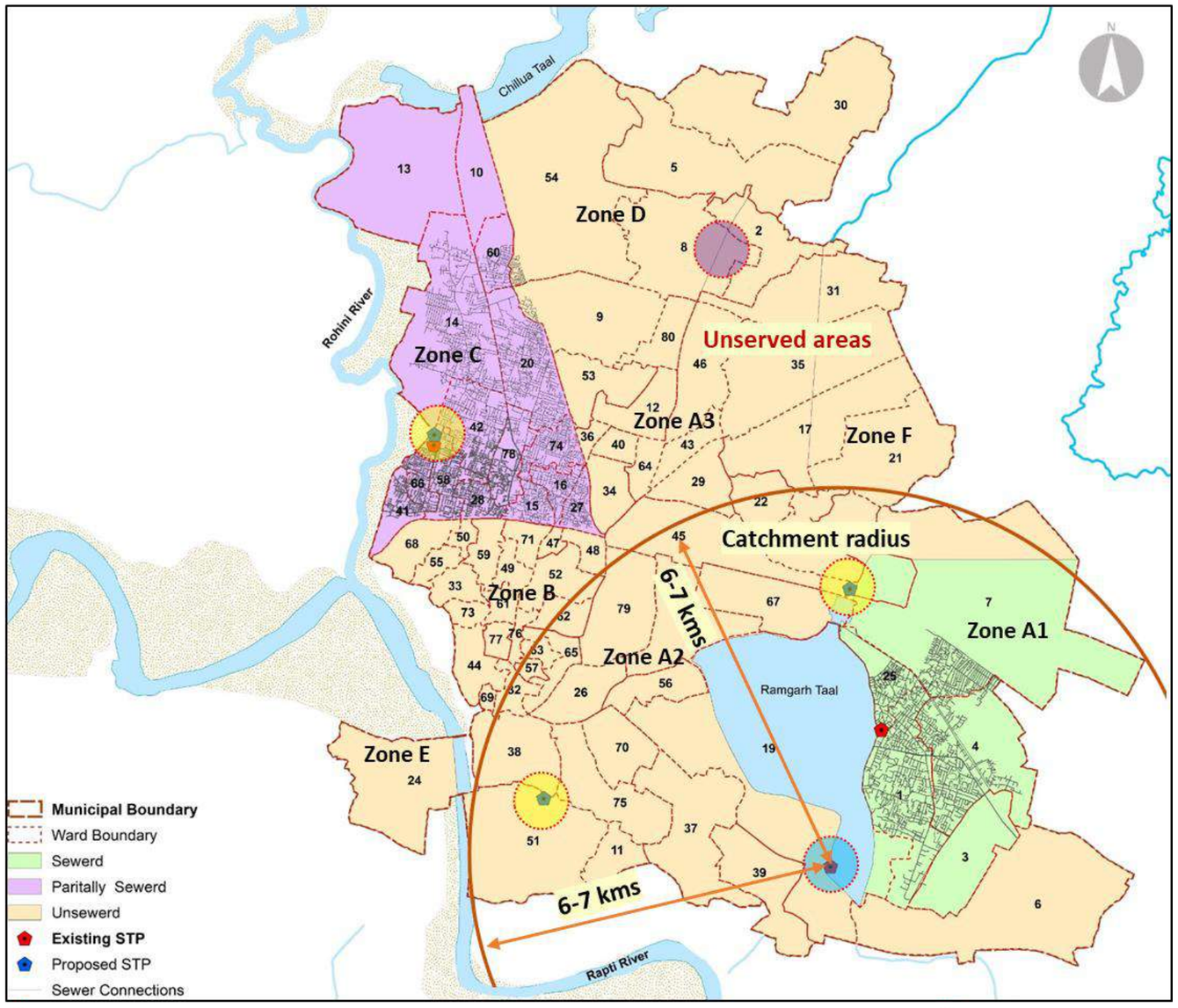

Chillua Taal
Rohini River
Zone D
Zone C
Unserved areas
Zone A3
Zone F
Catchment radius
6-7 kms
Zone B
Zone A2
Zone A1
Ramgarh Taal
Zone E
6-7 kms
Rapti River
Municipal Boundary
Ward Boundary
Sewerd
Paritally Sewerd
Unsewerd
Existing STP
Proposed STP
Sewer Connections
Co-Treatment Plant Proposed
Existing 50 KLD Co-Treatment Plant
Proposed FSTP

Image 6-3: 50 KLD Co Treatment Plant and Mobile FSSM vehicle in GMC

6.3.4 Intervention 5a: Construction of 3 Nos. Co-Treatment Plants in existing / under construction STPs.

The proposal involves construction of 20 KLD capacity co-treatment plants in Sewerage Zone A3 (38 MLD STP), Sewerage Zone C (10 MLD STP) and Sewerage Zone B (10 MLD STP) to enable systematic and environmentally safe treatment of faecal sludge alongside municipal sewage.

Proposed Intervention for Co-Treatment Plants

The selected sewerage zones represent strategic nodes within the city's sanitation network, each anchored by an operational or proposed STP. Locating co-treatment facilities within or adjacent to these STPs allows optimal use of existing infrastructure, including land, power supply, trained manpower and effluent disposal systems. These locations provide efficient coverage to surrounding catchments, reducing travel distances for desludging vehicles and improving service delivery efficiency. The distributed nature of the proposed facilities ensures decentralised handling of faecal sludge, thereby avoiding over-dependence on a single treatment location.

It is proposed to construct three separate co-treatment plants, each with a capacity of 20 KLD, integrated with the existing STPs in Sewerage Zones A3, C and B. The co-treatment plants shall be designed to receive faecal sludge collected from septic tanks and on-site sanitation systems and treat it in combination with sewage, without compromising the performance of the main STP processes.

Each co-treatment facility shall include:

- Dedicated septage receiving and unloading arrangements
- Screening and grit removal systems to protect downstream processes
- Equalization tanks for controlled dosing of septage
- Integration with existing STP treatment units for biological treatment
- Sludge handling and disposal provisions

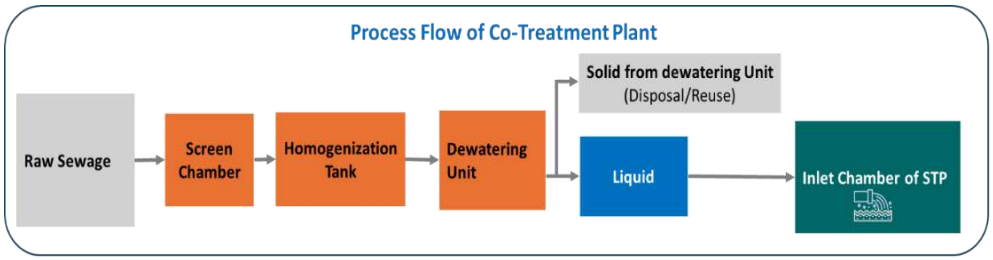


Image 6-4: Process Flow of Co-Treatment Plant

Implementation Framework:

Responsible agency: Jal Nigam Urban	**Estimated budget:** ₹2.4 Cr each ~ ₹7.2 Cr
Timeline: Mid term 5 Years	**Funding sources:** AMRUT, NMCG

6.3.5 Intervention 5b: Construction of 20 KLD Faecal Sludge Treatment Plant (FSTP) in Zone-D

Zone-D of Gorakhpur represents a predominantly unserved and partially sewered urban area, with a high dependence on on-site sanitation systems, including septic tanks and pit latrines. Despite the widespread presence of on-site sanitation infrastructure, effective management of faecal sludge remains limited due to inadequate treatment capacity and constrained spatial coverage of existing facilities.

At present, the city has a single 50 KLD co-treatment facility, which is insufficient to cater to the growing faecal sludge generation from unsewered and peripheral areas. Additionally, the long-haul distances from Zone-D to existing treatment locations discourage formal desludging practices and increase the risk of illegal dumping into drains, open land and waterbodies. The situation is compounded by the limited number of mobile FSSM vehicles, resulting in sub-optimal service coverage and irregular desludging cycles.

Proposed Intervention for Faecal Sludge Treatment Plant (FSTP)

The proposed FSTP in Zone-D is strategically located to serve surrounding unsewered and partially sewered catchments within a practical service radius of approximately 6–7 km, as indicated in the spatial analysis. The location allows efficient access for desludging vehicles, reduces travel time and fuel costs, and enables timely disposal of collected faecal sludge.

The site selection considers availability of land, buffer from residential areas, proximity to access roads and compatibility with surrounding land uses. Adequate buffer zones shall be maintained to mitigate odour, visual and traffic impacts, ensuring compliance with environmental and planning norms.

It is proposed to construct a 20 KLD Faecal Sludge Treatment Plant in Zone-D to treat faecal sludge collected from septic tanks and on-site sanitation systems within the designated catchment. The facility shall be designed as a stand-alone FSTP, capable of handling variable sludge characteristics and seasonal fluctuations in load.

The plant shall include:

- Receiving and screening arrangements for septage
- Sludge stabilization and treatment units
- Liquid effluent treatment and polishing units
- Sludge drying, handling and storage facilities

The treated effluent shall meet applicable discharge standards prior to reuse or disposal, while stabilized sludge shall be safely reused or disposed of in accordance with regulatory guidelines.

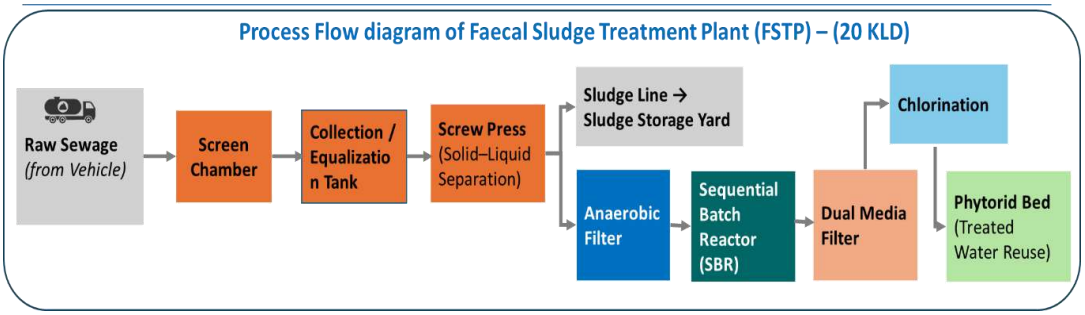


Image 6-5: Process Flow diagram of Faecal Sludge Treatment Plant (FSTP)

Implementation Framework:

Responsible agency: Jal Nigam Urban	**Estimated budget:** ₹4 Cr
Timeline: Mid term 5 Years	**Funding sources:** AMRUT, NMCG

6.3.6 Intervention 6: Preparation of Faecal and Septage Management Plan

Gorakhpur is experiencing rapid and largely unplanned urbanization, while sewerage connections remain limited. Although municipal projects are underway to expand the sewerage network, around >85% of the population still depends on septic tanks and soak pits.

Many of these containment systems are poorly designed and inadequately maintained, posing serious risks of groundwater contamination and environmental pollution. Furthermore, desludging of septic tanks is demand based and the city does not have scheduled desludging. The desludging vehicles of the city are owned by both private operators and the Gorakhpur municipal corporation. This scenario creates a broken sanitation value chain that leads to severe environmental, health, and administrative consequences. Specific gaps identified during field visits and stakeholder consultations are as follows.

1. Containment: Around 87.6% households depend on septic tanks due to lack of sewer lines. Many tanks are not watertight and lack baffles, with no municipal registry of tank size or desludging history.
2. Storage: No mechanism exists to measure sludge volume or effluent quality, and manual access points pose safety risks.
3. Transport: The city has around 11 Government and 13 private desludging vehicles. However, trucks discharge into manholes without controlled inlets and GPS/digital tracking is absent.
4. Treatment: Currently faecal sludge treatment facility is present at 50 KLD Co-treatment plant located within the premises of the 30MLD STP south of Ramgarh Tal.
5. Reuse: Currently faecal sludge is reused is limited to the 50 KLD co-treatment and sludge form mobile FSM vehicle at Mahewa Mandi in Transport Nagar.

Proposed Intervention

To bridge the identified gaps in containment, storage, transport, treatment, and reuse, the city must adopt a structured Faecal Sludge and Septage Management (FSSM) Plan. The plan should be anchored in clear municipal bylaws, licensing of service providers and ring-fenced O&M funding, ensuring accountability and sustainability is aligned with the Faecal Sludge and Septage Management in Urban Areas of India – Standard Operating Procedures (SOPs). The interventions below combine the baseline findings with SOP-mandated best practices to ensure technical compliance, environmental safety, and institutional accountability.

Intervention in Detail

1. Safe Containment

- Retrofit septic tanks to watertight standards with baffles, venting, and inspection ports.
- Ensure tanks are accessible for periodic desludging and designed to prevent leakage into drains or groundwater.
- Mandate a household registry capturing tank size, desludging history and effluent pathway.

Best practices: Tiruchirappalli (Tamil Nadu) has successfully implemented watertight septic tank retrofits and household registries under its citywide FSSM program.

City Application: Require immediate retrofitting and a centralized geo-tagged database of all onsite containment systems.

2. Scheduled and Regulated Desludging

- Establish bylaws mandating desludging cycles: 3–5 years
- Use licensed service providers operating GPS-equipped desludging vehicles to minimize illegal dumping

Best practices: Navi Mumbai (Maharashtra) has implemented a regulated desludging schedule with licensed operators and municipal monitoring.

City Application: Current practice is reactive desludging, with trucks discharging into inlet of 50 KLD Co-treatment plant the 30 MLD STP & facility present at Mahewa Mandi in Transport Nagar for the Mobile FSM vehicle**.** A regulated schedule will ensure safe handling of faecal sludge generated**.**

3. Transport and Tracking

- Deploy a digital tracking system (GPS + mobile app) for all desludging vehicles with trip logs integrated into municipal dashboards.
- Require geo-tagged proof of discharge at designated treatment points.

Best practices: *Bhubaneswar (Odisha)* has adopted GPS-based tracking of desludging vehicles, ensuring transparency and accountability.

City Application: GMC & Private Operated desludging trucks to be integrated with GPS-based tracking will prevent illegal dumping into drains and open lands.

4. Treatment Infrastructure

- Establish decentralized FSTPs at strategic locations to intercept untreated sludge before it enters drains and rivers. These units will reduce transport distances, minimize illegal dumping, and provide localized treatment capacity.
- Integrate faecal sludge into existing sewage treatment plants through co-treatment, with controlled inlet dosing to prevent shock loading and maintain stable performance. This approach optimizes resource use and reduces capital expenditure by leveraging existing infrastructure.

5. Reuse and Resource Recovery

- Convert treated sludge as compost, with compliance to Fertilizer Control Order (FCO) standards.
- Establish MoUs with horticulture, forestry and municipal parks for offtake.

Best Practices: *Indore (Madhya Pradesh)* has pioneered reuse of treated sludge as compost for municipal parks and agriculture.

City Application: The entire sludge is discharged untreated. Without reuse, the city loses potential recovery of 15–20 tons/month of compostable material.

6. Operation & Maintenance (O&M)

- Ensure continuous funding through ring-fenced municipal budgets dedicated to FSSM operations.
- Engage trained staff with quarterly refresher courses on SOPs, PPE use, and emergency response.
- Establish service contracts with private operators for plant operation, desludging and transport, tied to performance indicators.
- Institute preventive maintenance schedules for pumps, screens, drying beds, and mobile FSTPs, with independent audits.

Best Practices: *Warangal (Telangana)* has successfully ring-fenced O&M budgets and contracted trained operators for its FSTPs, ensuring >95% uptime.

City Application: GMC currently lacks dedicated O&M funding and trained staff for faecal sludge treatment. To sustain proposed 20 KLD co-treatments and the FSTP at Zone D, the city must adopt ring-fenced budgets, operator training, and service contracts to ensure long-term viability.

7. **Policy, Regulation & Institutional Framework**

- Draft and notify clear municipal bylaws regulating desludging frequencies, service standards, licensing, and fines for illegal disposal.
- Establish a dedicated FSSM Cell within the corporation to coordinate containment, desludging, transport, treatment, and reuse.
- Integrate with ICCC present in GMC, Launch citizen apps/SMS for service requests, compliance monitoring, and grievance redressal.

Best Practices: *Devanahalli (Karnataka)* has adopted municipal bylaws for desludging cycles and established a dedicated sanitation cell, ensuring compliance and transparency.

City Application: GMC currently operates without enforceable bylaws, leading to informal desludging and uncontrolled disposal into manholes and drains. Adoption of bylaws regulating 3–5-year desludging cycles, licensing of the private desludging vehicles and penalties for illegal dumping will institutionalize accountability and align with national SOPs.

Draft Scope of Work for Faecal Sludge and Septage Management (FSSM) is presented in Image 6-6.

Implementation Framework:

Responsible agency: Lead: GMC Support: Jal Kal and Jal Nigam	**Estimated budget:** ₹0.5 Cr
Timeline: Short term 6-9 months	**Funding sources:** SUDA; SBM (Urban) – FSSM component; AMRUT

6.3.7 Intervention 7: Strengthening the treatment components of existing phytoremediation project in Ilahibagh Nallah

Ilahibagh Nallah is one of the major urban drains of Gorakhpur that carries significant quantity of used water (18 MLD minimum flow and 46 MLD maximum) to the Rapti River. As an interim measure Nature Based Solution (NBS) of in-situ phytoremediation was implemented along a stretch of approximately

2.4 km near Takiya Ghat to reduce organic pollution, improve dissolved oxygen levels, and enhance the self-purification capacity of the Nallah.

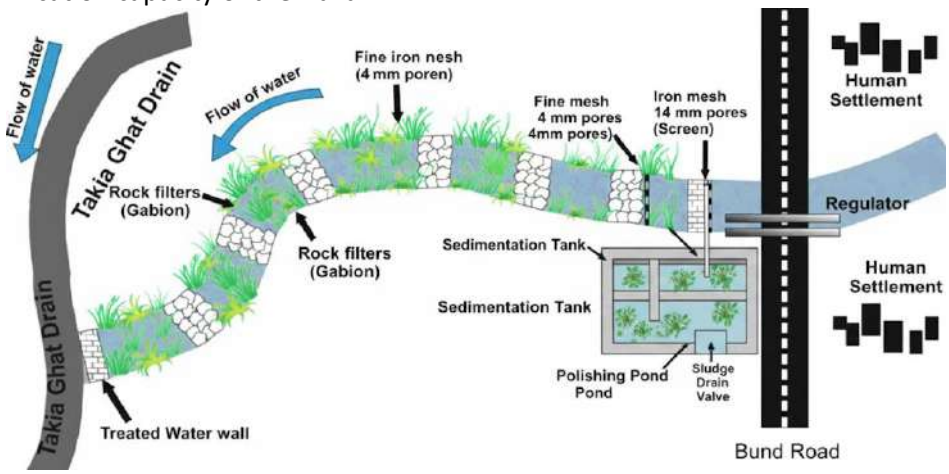


Image 6-6: Existing design

The system was designed as a low-cost, low-energy, decentralized treatment measure, relying on aquatic and semi-aquatic vegetation to facilitate pollutant uptake, microbial activity, and natural attenuation of contaminants. However, during recent monsoon, the project site experienced submergence and high-flow conditions, which resulted in substantial damage to plantations, loss of plant density, and deterioration of vegetative health.

Image 6-7: Takiya Ghat Phytoremediation Project Pre-monsoon (left) and Post Monsoon (right)

This has led to impairment of the system in achieving the desired level of used water treatment efficiency. Presently the DO values at the start and end points of the system were recorded to be 1.3 and 2.9 respectively.

Image 6-8: Takiya Ghat Phytoremediation Project DO of 1.3 at Staring Point (left) and DO of 2.9 at outlet of River Rapti (right)

Proposed Intervention: The loss of plants in the in-stream Nature-Based Solution (NBS) during monsoon is a case of hydraulic failure where the shear stress of the floodwater exceeds the anchoring strength of the vegetation. To make the system more resilient a shift from a "resistance" strategy to an "avoidance" or "reinforcement" strategy is proposed.

The specific engineering and vegetative changes proposed for the Takiya Ghat drain system are as follows:

1. **Civil Works - Construction of a Diversion Weir and a bypass channel:** The diversion structure (weir or sluice gate) at the inlet shall ensure that when water levels rise above a specific height, the excess water automatically jumps and flows into a 800mm storm relief bypass pipeline. Thus, the excess monsoon peak flow of 28 MLD never enters the planted zone.
2. **NBS and Bioengineering measures:**
    - **Substrate stabilisation:** Replantation is proposed on heavy-duty, biodegradable Coir Geotextiles (700-900 GSM) that are placed over the soil surface of nallah bed before planting. This will ensure locking the soil in place, so the roots have something to hold onto.
    - **Velocity control and gabion repair:** Energy Dissipation (Boulders), Random rubble/ boulder placement in nallah bed and gabion boxes at critical curves are proposed to break up the laminar high-speed flow into slower, turbulent eddies.
    - **Replantation:** It is proposed to switch to species with high hydraulic resistance by avoiding broad-leaf plants like Canna or Taro (Colocasia) that act like sails and rip out. Instead, flexible, grass-like species that lay flat under high flow without breaking, such as Vetiver (*Chrysopogon zizanioides*), Phragmites karka, or Typha are proposed. Vetiver has a vertical root system that can penetrate upto 4 meters, thus acting as living steel bars for the soil. Further, to reduce the drag force it is proposed to cut the plants down to about 6-12 inches just before the rains.

The cost of proposed intervention is approximately ₹ 1.9 Crores (refer Annexure 2)

Implementation Framework:

Responsible agency: Jal Nigam Urban, GMC	**Estimated budget:** ₹ 1.9 Cr
Timeline: Short Term 5-6 Months	**Funding sources:** AMRUT, NMCG

6.3.8 Intervention 8: Monetizing the water hyacinth removed from Ramgarh Tal and Chillua Tal

Ramgarh Tal and Chillua Tal are ecologically significant urban waterbodies in Gorakhpur, performing critical functions such as flood moderation, groundwater interaction, biodiversity support and recreational value. However, sustained inflow of nutrient-rich used water combined with stagnant hydraulic conditions, has led to excessive algal growth and proliferation of invasive aquatic weeds such as water hyacinth. Whereas, Ramgarh Tal receives sewage from the adjacent nallahs, Chillua Tal receives agricultural nutrients and pollutants from nearby fields.

While steps are being taken to reduce pollution load in the lakes through diversion of used water from drains and treatment in STPs, periodic removal of water hyacinth from the lakes too is needed due to the following reasons:

1. Water hyacinth is one of the most efficient plants at absorbing excess nitrogen and phosphorus. However, when it dies it sinks to the bottom, rots and releases all the stored nutrients back into the water
2. Water hyacinth multiplies explosively, forming a thick, interlocking mat over the surface which blocks sunlight and air exchange. This creates "anoxic" (zero oxygen) conditions where fish suffocate and die, and the water turns foul-smelling.
3. It creates an ecological dead zone and accelerated biodiversity loss as native plants are shaded out and eliminated destroying the food web for local birds and aquatic life. Further, it creates predatory imbalance as mosquitoes breed rapidly in the stagnant water trapped between the leaves, protected from fish that would usually eat their larvae.
4. Evapotranspiration rate of water hyacinth is 3 to 4 times the rate of open water evaporation. Thus hyacinth-covered lake dries up much faster than an open one.

While removal of water hyacinth is attempted periodically by the municipal administration, gainful use (monetization) is virtually non-existent, turning this potential resource into a solid waste management crisis.

Intervention for Ramgarh Tal: A Co-Processing strategy is proposed to monetize the weed from Ramgarh Tal, the quantity of which is likely to reduce after the lake gets clean. A wet waste Co-digestion plant is proposed designed to run on a mix of 30% Water Hyacinth and 70% Municipal Wet Waste (market waste/hotel food waste). As the lake gets cleaner and hyacinth supply drops, intake of city garbage can be increased so that the infrastructure remains useful permanently. The Bio-CNG produced can be used to fuel the city's garbage collection trucks or Ramgarh Tal tourist boats.

Heavy metals in the weeds do not evaporate into the gas and will stay in the sludge (digestate) which is a safe energy product. Based on results of batch testing of the dry sludge it can be used as follows:

- If heavy metals are within Fertilizer Control Order (FCO) limits, it may be sold as City Compost to local farmers (high revenue).
- If heavy metals are high, the sludge maybe exclusively used for Non-Edible Landscaping in the city.

The collection and processing of the weeds will be mechanised to minimise human contact. Image 6-9 presents the process flow of recommended interventions.

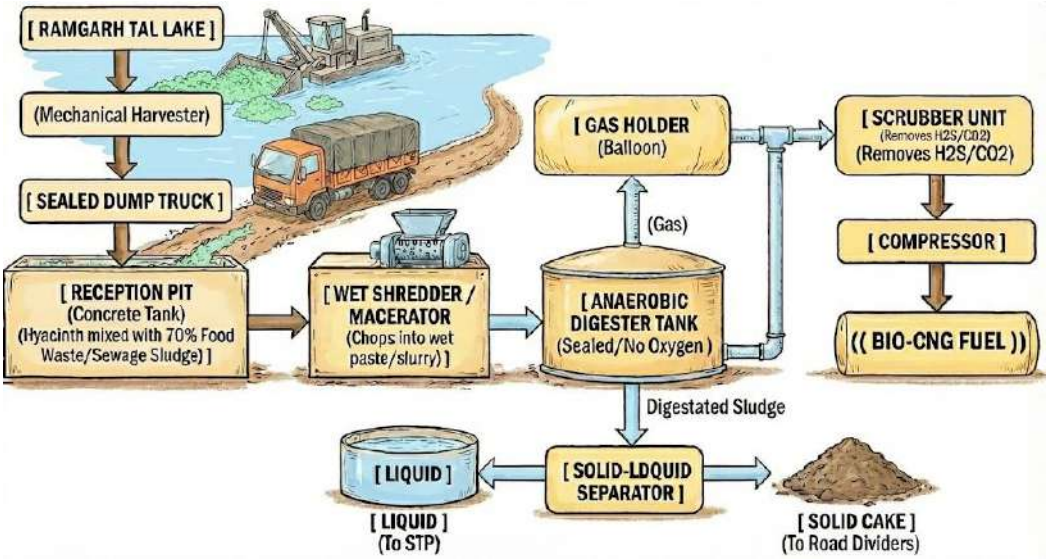


Image 6-9: Process flow of Co-digestion of Ramgarh Tal weeds

The cost of setting up the collection and processing system will cost approximately ₹ 25 Crores (refer Annexure 3)

The project can be taken up in two phases as follows:

Phase 1 - Pilot plant of ₹5 Cr: A 150 m^3 plant may be built near the Zoo STP. 3-5 Tonnes/day weeds can be harvested from the lake to feed it. The gas generated maybe used to power the Zoo's internal vehicles or cafeteria.

Phase 2 - Scale-Up to ₹25 Cr: Once the technology is proven to work on Gorakhpur's specific weed strain, GMC can apply for MNRE Central Financial Assistance (CFA) for subsidies of up to ₹4 Crore per 4800 kg/day capacity for Bio-CNG projects. This can help fund the expansion to the full ₹25 Crore facility.

Intervention for Chillua Tal: A Boutique cum Briquette (fuel pellet) solution is proposed for monetizing the weed removed from Chillua Tal as it does not face the issues of heavy metal contamination. Manual weed removal and sorting is proposed to separate craft quality weed from the remaining biomass.

- GMC may partner with a local Self-Help Group (SHG) to develop paper, bags, and yoga mats which may be sold at souvenir shops in the city and adjacent to the lakes branded as "Products that clean our Lake." This will serve as a low-volume but high-visibility public relations win.

For the rest of the weed biomass a decentralized Biomass Briquetting Unit can be set up on the banks of Chillua Tal. The harvest can be dried on the banks and compressed into briquettes to be sold to local brick kilns or small industries as a coal substitute (Green Coal). Image 6-10 presents the process flow of the recommended interventions.

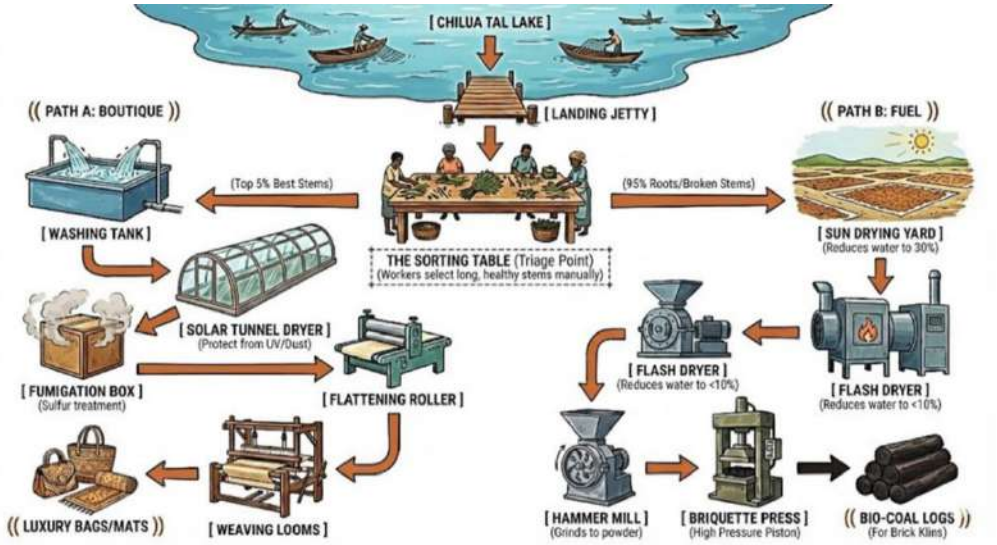


Image 6-10: Process flow of Co-digestion of Chillua Tal weeds

The cost of setting up the collection and processing system will cost approximately ₹ 0.45 Crores (refer Annexure 4)

Implementation Framework:

Responsible agency: GDA, GMC	**Estimated budget:** Ramgarh Tal - ₹ 25 Cr Chillua Tal - ₹ 0.45 Cr
Timeline: Short Term RAmgarh Tal: 18 months Chilua Tal: 7-8 Months	**Funding sources:** UPNEDA, SBM 2.0, DAY NULM, PPP

6.4 Objective 3 Interventions to rejuvenate waterbodies and wetlands in the city

GMC area contains 130 Waterbodies out of which 54 waterbodies are above 1 acre, including major lakes and ponds such as Ramgarh Tal, Chillua Tal, Rapti & Rohini floodplain waterbodies, and several smaller talabs and wetlands distributed across the city. These waterbodies play an important role in flood moderation, groundwater recharge, and urban ecology. However, many are affected by encroachments, siltation, and inflow of untreated sewage and solid waste, leading to deterioration of water quality and reduction in storage capacity. Strengthened protection, pollution control, and integration of waterbodies into the city's water management framework are required to restore their functional role.

6.4.1 Intervention 9: To create Water Body Database at City level and integration with the existing ICCC of the municipal corporation

Gorakhpur Municipal Corporation comprises waterbodies and wetlands, which collectively plays a crucial role in urban flood regulation, groundwater recharge, biodiversity conservation, and microclimate moderation. However, the absence of a comprehensive, city-level inventory and monitoring system has limited the ability of the Urban Local Body (ULB) to effectively protect, manage, and rejuvenate these assets. Fragmented data, unclear jurisdiction, encroachments, and unregulated inflows of sewage and solid waste have resulted in progressive degradation of water quality and storage capacity of several waterbodies.

To support systematic rejuvenation and long-term management, there is a need to establish a dynamic, spatially enabled waterbody database that captures baseline information and enables continuous monitoring and informed decision-making.

Proposed Intervention

The proposed project aims to **create a comprehensive Waterbody Database at the city level** and integrate it with the **Integrated Command and Control Centre (ICCC)** of Gorakhpur Municipal Corporation. The database will serve as a centralized digital repository of all waterbodies within municipal limits and will support real-time monitoring, planning, and enforcement actions across agencies.

The development of the city-level waterbody database shall be guided by the **Urban Water Body Diagnostic Tool (UWD)**3 developed by the **National Institute of Urban Affairs (NIUA)**. The UWBDT provides a standardized framework for systematic assessment of urban waterbodies covering parameters such as physical condition, hydrological connectivity, water quality, ecological health, governance arrangements, and risk factors.

3 https://uwdtool.in/ ; https://nmcg.nic.in/writereaddata/fileupload/56_Urban-Water-Body-Diagnostic-Tool-Manual.pdf

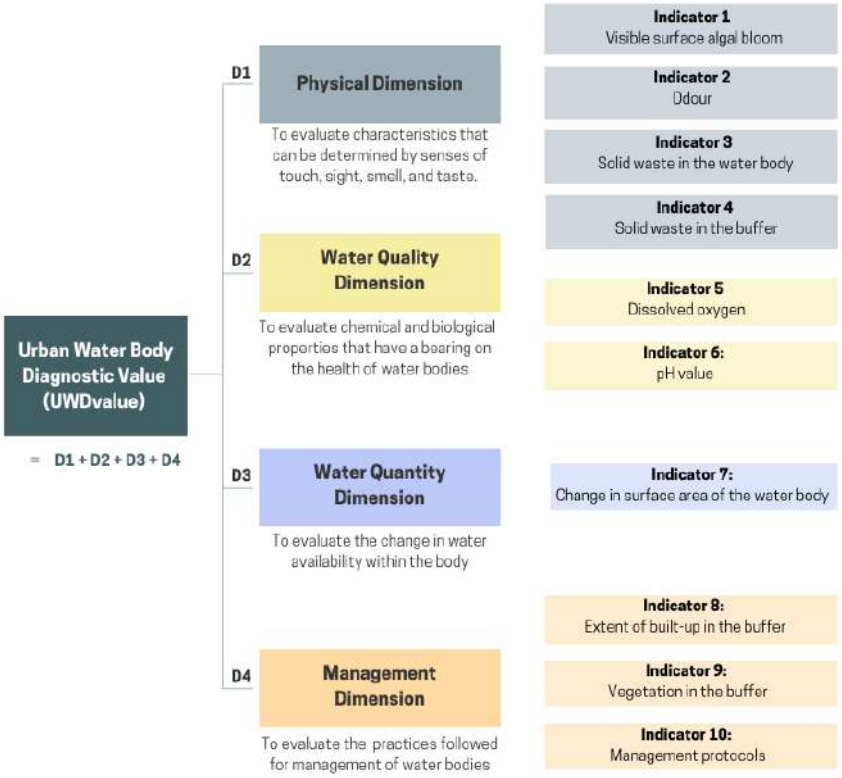


Image 6-11: Urban Waterbody Diagnostic Key Parameters

Key components of the database will include:

- Geo-referenced mapping of all waterbodies (area, boundary, catchment)
- Ownership and administrative details
- Current land-use and encroachment status
- Hydrological connectivity with drains, rivers, and floodplains
- Water quality parameters and pollution sources
- Economic Potential (Boating, Fishing, Recreational)
- Flooding and waterlogging history
- Rejuvenation status and maintenance records

Integration with ICCC

Integration of the waterbody database with the ICCC will enable:

- Real-time visualization of waterbody conditions through GIS dashboards
- Integration water parameters and water quality data (where available from GDA, UPPCB, Fisheries etc)
- Monitoring of encroachments and land-use changes using satellite imagery (GMC & GDA)
- Early warning and decision support during flood events (UFMC cell of GMC & IMD)
- Coordination across departments & stakeholders such as engineering, environment, sanitation, and revenue.

Implementation Framework:

Responsible agency: GMC, GDA, UPPCB	**Estimated budget:** ₹ 12.3 Cr
Timeline: Short term 1-2 Years	**Funding sources:** AMRUT 2.0 – Reform & Capacity Building Component, NMCG, UP Urban Development funds, 15th Finance Commission – Tied Grants (Water & Sanitation)

For detailed costing please refer (Annexure 7)

6.4.2 Intervention 10: To undertake urban waterbody rejuvenation

Gorakhpur's physical setting defined by a **high groundwater table, flat bowl-shaped topography, and seasonal backflow from the Rapti and Rohini rivers** makes the city particularly vulnerable to **localised flooding and prolonged waterlogging during monsoon months**. Unlike cities experiencing groundwater depletion, Gorakhpur's principal challenge is the **management of excess surface runoff rather than recharge enhancement.** Historically, urban ponds functioned as natural detention basins, absorbing peak monsoon flows and releasing water gradually once river levels receded. The degradation of these systems has directly contributed to increased flooding intensity and duration in low-lying wards.

In the context of increasing rainfall variability and climate change impacts, systematic rejuvenation of urban waterbodies is essential to restore their role as **stormwater holding, flood moderation, and ecological assets,** while ensuring long-term sustainability and public value.

Proposed Intervention

Using the NIUA Urban Water Body Diagnostic Tool, the 27 major ponds were scored across physical, water quality and hydrological, and socio-economic dimensions. Based on composite scores, they were categorized into priorities as presented in Table 6-3.

Table 6-3: Prioritization of Waterbodies in Gorakhpur

Priority	Focus	Number of Ponds	Key Issues Addressed
Priority A	Drainage & Sanitation-first	22	Raw sewage inflows, solid waste, low DO, sanitation
Priority B	Stormwater retention basins for flood moderation and climate resilience	2	Flooding and Waterlogging issues
Priority C	Recreation & Amenity Upgrades	3	None currently qualify; potential post-sanitation

- **Physical Parameters** (extent of encroachment, buffer condition, nature of bed)
- **Water Quality and Hydrology** (used water inflows, solid waste dumping, dissolved oxygen)
- **Social and Spatial Context** (accessibility, cultural significance, surrounding land use)

Based on composite scores, spatial location, and functional potential, waterbodies were categorised into intervention priorities. This data-driven approach ensures that limited municipal resources are allocated to waterbodies offering the **highest flood-mitigation and resilience benefits**, while preventing premature or inappropriate beautification.

Strategic Categorisation of Urban Waterbodies

Urban waterbodies in Gorakhpur are categorised into the following intervention priorities:

- **Priority A:** Drainage and sanitation-first waterbodies
- **Priority B:** Stormwater retention basins for flood moderation and climate resilience
- **Priority C:** Recreation and amenity-oriented waterbodies (post-stabilisation)

This phased approach ensures that **pollution control and hydrological stabilisation precede recharge, recreational, or aesthetic interventions**, thereby avoiding maladaptive investments.

Priority A: Drainage and Sanitation-First Waterbodies

Characteristics: Priority A waterbodies are severely degraded and typically exhibit:

- Multiple untreated used waters and drain inlets
- Heavy solid waste dumping
- Low or critically depleted dissolved oxygen levels
- High encroachment pressure and degraded buffers

Such ponds currently function as **oxidation tanks or waste sinks** and are unsuitable for flood moderation, recharge, or recreational use until sanitation issues are resolved.

Implementation Measures for Priority A

- **Interception and Diversion (I&D) Drains:** Construction of peripheral drains to divert untreated used water away from ponds and towards existing or proposed treatment facilities.
- **Decentralised Used water Treatment:** Installation of Phytorid wetlands or DEWATS using gravel beds and native macrophytes (vetiver, canna, reeds) to treat minor inflows.
- **Solid Waste Management:** Removal of accumulated waste, installation of bamboo or eco-fencing along at least 70–80% of the periphery, and provision of signage to prevent re-dumping.
- **Aquatic Weed Management:** Manual removal of invasive species and introduction of floating wetlands to improve dissolved oxygen levels.
- **Buffer Zone Protection:** Establishment of a minimum 4.5–9 m vegetated buffer to prevent further encroachment and filter runoff.

Priority A interventions are **sanitation-led** and must be completed before any further functional upgrades are considered.

Priority B: Stormwater Retention Basins (Flood Moderation & Climate Resilience)

Characteristics: Priority B waterbodies typically demonstrate:

- Natural or semi-natural soil beds suitable for temporary surface water detention
- Moderate accessibility and limited built-edge development
- Location within **flood-prone wards, low-lying bowls, or peri-urban runoff accumulation zones**
- Limited used water inflows that do not compromise detention capacity

These ponds are unsuitable for recharge-centric interventions due to Gorakhpur's high groundwater table but are critical **for attenuating peak monsoon runoff**.

Implementation Measures for Priority B

- **Enhancement of Stormwater Holding Capacity:**
  Selected ponds shall be selectively deepened to enhance storage volume. Deepening shall be restricted to **40–60% of pond area**, achieving depths of **3.0–3.5 m**, while retaining shallow ecological zones. Excavated silt shall be reused for embankment strengthening and buffer landscaping.
- **Sedimentation Basins at Inlets:**
  Sedimentation basins covering **5–10% of inflow areas** shall be constructed using stone bunds and vegetated traps to prevent silt accumulation and loss of storage capacity.
- **Controlled Release Structures:**
  Sluice gates or orifice-controlled outlets shall be installed to regulate discharge during and after rainfall events. Overflow weirs shall ensure safe passage of excess water during extreme rainfall. Retention periods of **24–72 hours** shall be maintained based on downstream river levels.
- **Embankment Strengthening:**
  Stone pitching up to **0.6–0.9 m height**, geo-textile reinforcement where required, and gentle inner slopes (1:2 to 1:3) shall be provided to prevent erosion and breach.
- **Vegetated Buffer Zones:**
  A vegetated buffer of **4.5–9 m** shall be maintained using native grasses, vetiver, bamboo, and shade trees to filter runoff and enhance microclimatic cooling.

Priority C: Recreation and Amenity-Oriented Waterbodies

Priority C waterbodies are those where sanitation and hydrological stability have been achieved and which exhibit:

- Good accessibility
- Cultural or community significance
- Stable water quality
- Surrounding residential or institutional land use

Implementation Measures for Priority C

- **Limited Ghats and Pathways:** Development along 15–20% of the periphery using stone or bamboo decking.

- **Aeration Infrastructure:** Installation of solar-powered aeration fountains to improve dissolved oxygen and aesthetics.
- **Lighting and Safety:** Solar lighting and recycled signage for safe public use.
- **Cultural Activity Zones:** Designated seasonal platforms for Chhath and community events (10–15% of periphery).
- **Enhanced Green Belt:** Planting of native flowering and shade trees to strengthen the ecological buffer.

Implementation Framework

Responsible agency: GMC	**Estimated budget:** ₹ 0.58 Cr *(for 1 Waterbody as per DPR & feasibility)*
Timeline: Mid term 3-5 Years	**Funding sources:** AMRUT 2.0 – Water & Green Infrastructure Components, NMCG, NPCA, 15th FC, GMC Own Funds

Interventions shall be implemented in a phased and coordinated manner:

- **Phase I (Short Term):** Sanitation, solid waste removal, inlet management, and encroachment control
- **Phase II (Medium Term):** Stormwater detention enhancement, embankment strengthening, and buffer development
- **Phase III (Long Term):** Recreation and amenity upgrades for eligible waterbodies

Image 6-12: Conceptual waterbody rejuvenation illustration

Recommendation for Waterbodies Below One Acre

Smaller waterbodies below one acre, though limited in size, play a critical role in **local stormwater retention, micro-drainage management, and ecological continuity.** These sites are particularly important in dense wards where larger detention spaces are unavailable.

Implementation Measures for Waterbodies Below One Acre

- **Mapping and Monitoring:** GIS-based mapping and regular inspection to prevent encroachment and dumping.
- **Micro-Detention Design:** Shallow deepening and edge shaping to allow temporary storage of stormwater during peak rainfall.
- **Nature-Based Solutions:** Development of rain gardens, bioswales, and micro-wetlands around peripheries.
- **Drain Integration:** Linking small ponds with local stormwater drains to act as intermediate holding basins.
- **Policy Integration:** Formal inclusion of sub-acre waterbodies in URMP and Master Plan no-development and blue-green infrastructure layers, and prioritise 3m – 9m buffer as applicable from the masterplan.

6.4.3 Intervention 11: Development of Parks and Cycle Tracks along Gurdahiya Nallah

Image 6-13: Channelization of the Gurdahiya nallah and laying of sewer lines

Intervention: It is proposed that the 4.5m wide pathways be used for the following purposes:

1. **Pedestrian and cycle pathways along the nallah:** 2m side pedestrian pathway of permeable pavers along with 2.5m width cycle track of porous concrete are proposed on either bank of the nallah. Improvement of water quality in nallah shall provide an attractive walking and cycling stretch for the city.

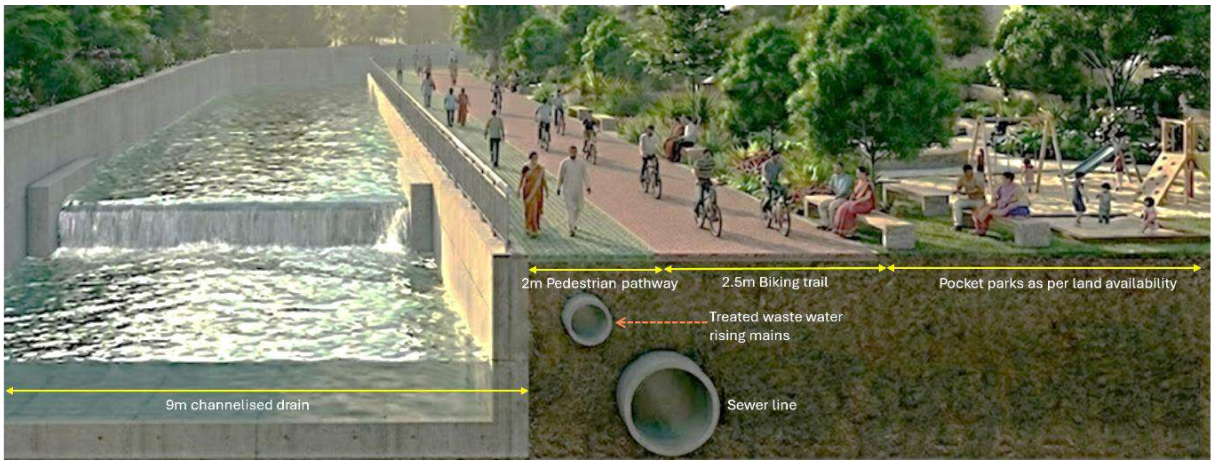


Image 6-14: Development of pedestrian and cycling pathways along nallah

2. **Pocket parks along the pathways:** The walking and cycling stretch shall provide access of incidental spaces along both sides of the nallah. GMC should identify all such government and community spaces on either side of the nallah and create pocket parks for the nearby residents. As per size they may function as community gathering places, children play area, open gym, sitting area, etc.

Image 6-15: Integration of pocket parks with walking and biking trail

Implementation Framework

Responsible agency: GMC	**Estimated budget:** ₹ 57.6 Cr
Timeline: Short term 1-3 Years	**Funding sources:** Municipal, NMCG, AMRUT, MoHUA – Urban Mobility Grants, CSR

For detailed costing please refer (Annexure 9)

6.5 Objective 4 Interventions to enhance riparian buffer along riverbank

Riparian stretches comprising vegetated strips alongside rivers and natural drains are essential "living infrastructure" in cities because they perform critical services that cannot be provided by concrete edges. These include:

- **Flood & Agricultural Runoff Control:** Riparian stretches absorb excess rainwater and slow down runoff, preventing downstream flooding.
- **Water Purification:** The soil and roots filter out toxic urban pollutants and sediments before they reach the river.
- **Climate Regulation:** They cool the surrounding area thereby combating "Urban Heat Island" effect.
- **Biodiversity and Recreation:** They serve as valuable green space for human mental health and recreation.

The riparian stretches on both banks of Rapti and Rohini River was analysed and differentiated between degraded and healthy stretches. Interventions have been proposed for restoration of degraded stretches whereas conservation and preservation recommendations have been proposed for the relatively healthy stretches in the following paragraphs.

Image 6-16: Degraded Riparian stretches at Rapti River Near Lalpur Tikar

Image 6-17: Degraded Riparian stretches at Rohini River near Sitkaur

Image 6-18: Dense Riparian stretches at Rapti River near Betua Bypass

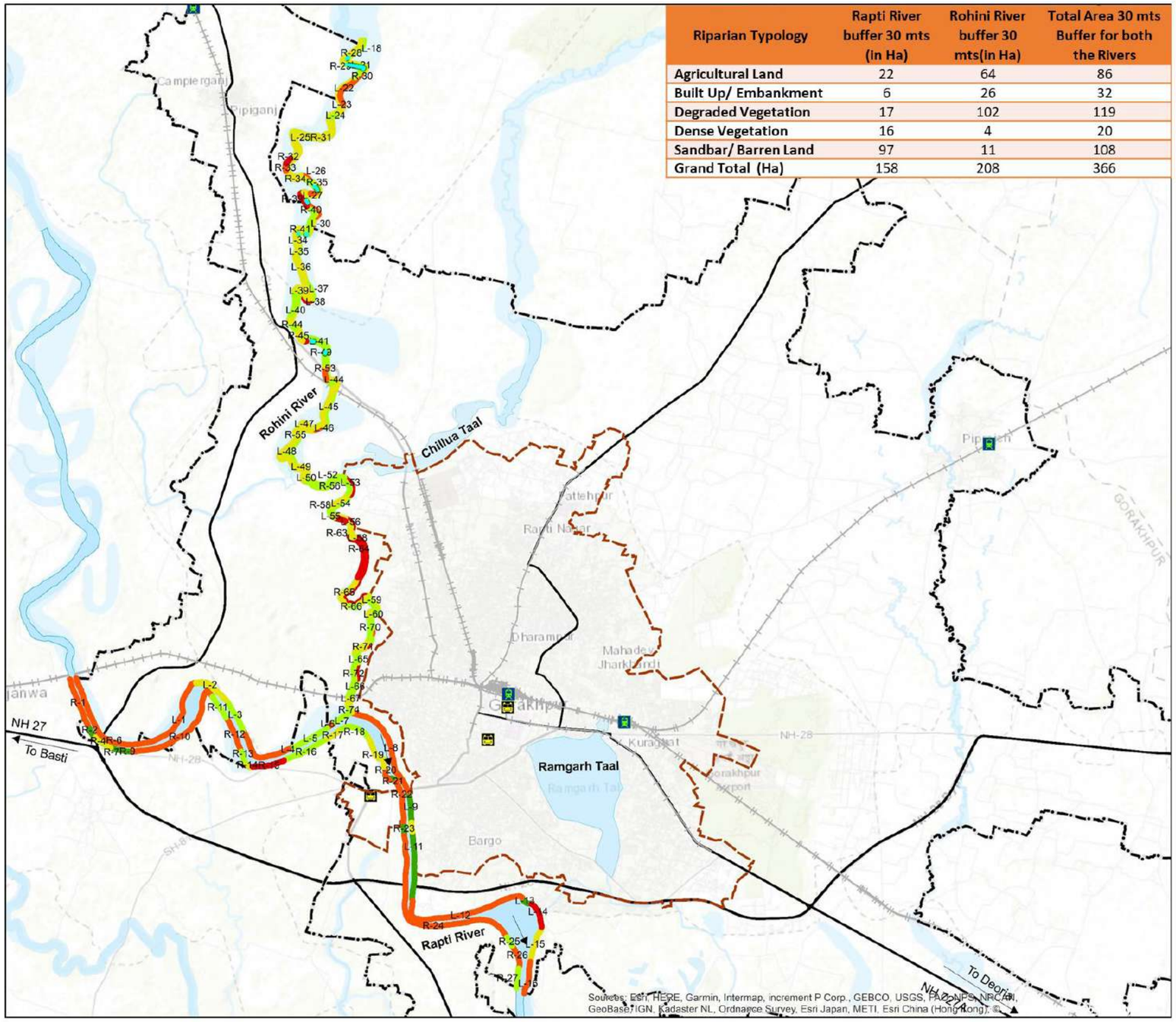
Image 6-19: Dense Riparian stretches at Rohini River near Nautanwa

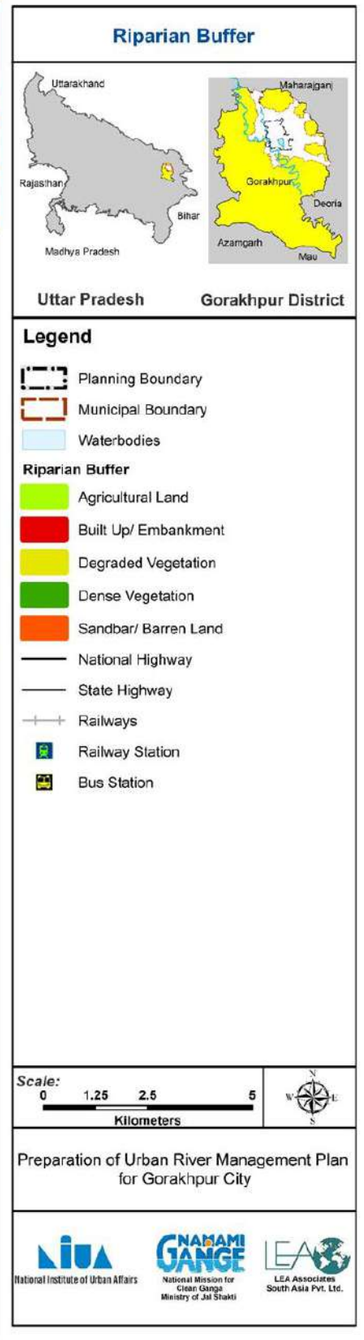
6.5.1 Intervention 12: Plantation of Native Species for bank stabilization with NBS along southern edge of Rapti river and Northern Periphery of the Rohini River

Analysis of the 30 m riparian buffer along the Rapti and Rohini rivers refer Map 6-4, covering 366 ha, indicates varying levels of ecological integrity and human intervention. A significant portion of the buffer comprises degraded vegetation (119 ha) and sandbar/barren land (108 ha), reflecting disturbance, erosion, and reduced buffering capacity. Agricultural land (86 ha) and built-up/embankment areas (32 ha) within the buffer highlight encroachment and competing land uses, particularly along the Rohini River. Only 20 ha of the buffer retains dense vegetation, indicating limited intact riparian stretches. The typology underscores the need for targeted protection, restoration, and regulation of riparian zones to enhance river health and flood resilience.

To address the localized degradation, bank erosion and declining structural stability were observed along the Rapti and Rohini River as shown in Map 6-4. A Three-Zone Riparian Buffer Restoration Strategy is proposed on both banks across the identified degraded stretches. This approach systematically restores vegetation in layers based on proximity to the river channel, ensuring that ecological and hydraulic functions are strengthened in a coordinated manner.

Riparian Typology	Rapti River buffer 30 mts (in Ha)	Rohini River buffer 30 mts(in Ha)	Total Area 30 mts Buffer for both the Rivers
Agricultural Land	22	64	86
Built Up/ Embankment	6	26	32
Degraded Vegetation	17	102	119
Dense Vegetation	16	4	20
Sandbar/ Barren Land	97	11	108
Grand Total (Ha)	158	208	366





Map 6-4: Riparian Buffer Assessment of Rapti and Rohini Rivers

Proposed key actions for restoration

The proposed riparian restoration interventions on the Rapti and Rohini Rivers focus on bio-engineering–based riverbank stabilization, establishment of a multi-zone riparian buffer, and enhancement of native vegetation to improve ecological integrity and flood resilience. Measures such as vetiver and grass plantations, bamboo clumps, and live staking are proposed to stabilize eroding banks while avoiding hard engineering wherever feasible. A three-zone riparian buffer comprising grasses and sedges, shrubs, and native tree species is recommended to reduce nutrient runoff, dissipate flood energy, and enhance habitat connectivity. Native species–based plantation and gradual replacement of invasive species will support long-term riparian stability and biodiversity, while vegetated filter strips and improved agro-domestic practices will help control non-point source pollution. Collectively, these interventions aim to restore natural riparian functions, reduce erosion and pollutant loads, and create a self-sustaining river edge system.

Before intervention, the riverbank is bare, eroded, and has minimal vegetation, after implementing the proposed zonal riparian intervention, the degraded stretches of both rivers will be transformed into a continuous and dense green buffer. Grasses, shrubs and native trees will work together to stabilize the riverbanks, reduce flood impacts and improve water quality. This intervention will also enhance biodiversity along the river corridor. The before and after intervention conditions are illustrated in the image below.

Components	Key Actions/ Species	Expected Outcome
1. Stabilize Eroding Riverbanks (Bio-engineering)	Vetiver, kans grass, bamboo clumps, live staking, brushwood check structures; avoid concrete where not required	Reduced erosion, bank stability, safer flood margins
2. Establish Three-Zone Riparian Buffer	Zone-1 grasses & sedges, Zone-2 shrubs/small trees, Zone-3 native trees	Reduced nutrient runoff, pesticide interception, flood energy dissipation
3. Riparian Plantation & Habitat Restoration	Native species clusters (Arjun, Jamun, Peepal, Siris, Bamboo), avoid monoculture	Biodiversity enhancement, long-term riparian stability
4. Pollution Source Management (Agro & Domestic)	Vegetated filter strips, compost pits, controlled fertilizer use awareness	Reduced nutrient & pesticide loading
5. Replacement of invasive species by Native Species Integration	**Recommended native species (site-suitable):** • Anisomeles indica (Lamiaceae) • Leucas aspera • Achyranthes aspera • Saccharum spontaneum **Implementation notes:** • Gradual removal of invasive plants to avoid exposed bare soil • Sequential planting during pre-monsoon/monsoon • Periodic weed control and survival monitoring	• Restoration of native riparian habitat and biodiversity. • Gradual suppression of invasive species through healthy native cover. • Lower maintenance requirement over time due to self-sustaining native vegetation.

Multi-zonal approach for riparian stretches design

A 30-50 m wide riparian buffer zone from the edge of river is proposed to be implemented in the identified stretches. The buffer will have three zones as shown in Figure 6-4.

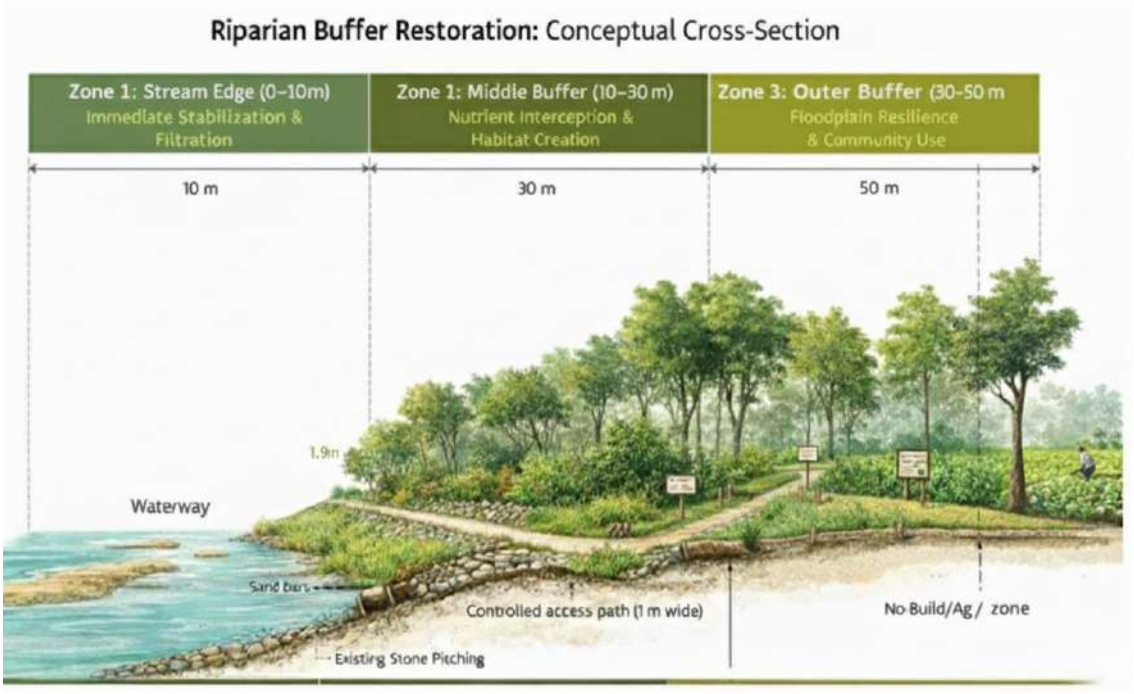


Figure 6-4: Section of the Proposed riparian stretch along eastern and western bank of the river

Zone wise proposed species and its ecological benefits

The riparian buffer is structured into functional zones, with species selected based on hydrological tolerance, rooting depth and ecological performance. Zone-specific plantings are intended to optimize bank stabilization, nutrient filtration and habitat functioning across the river corridor. The native plant species recommended for each riparian zone are summarized in the table below.

Table 6-4: Native plant species recommended for each riparian zone

Zone	Width	Species name	Relevance to Rapti / Rohini Context	Pollution Control Function	Flood Control Function
Zone 1 – Grasses & Sedges (Immediate Stream Edge)	**0-10 m**	*Vetiveria zizanioides* (Vetiver / Khus)	Performs well on loose alluvial soils	High nitrate/phosphate uptake, pesticide adsorption	Deep roots anchor toe of bank, reduces scouring
		Cynodon dactylon (Doob grass)	Survives grazing & seasonal waterlogging	Filters runoff, strong nitrogen uptake	Forms dense mats, holds soil during flood recession
		Saccharum spontaneum (Kans grass)	Common on Rapti floodplains, easy to establish	Captures sediments carrying fertilizers	Flexible stems dissipate flood velocity
Zone 2 – Shrubs & Small Trees (Pollution Interception Zone)	**10-30 m**	*Vitex negundo* (Nirgundi)	Tolerates seasonal flooding & drought	Absorbs pesticides, hardy & low maintenance	Breaks flood velocity, shields inner vegetation
		Clerodendrum inerme (Glory bower)	Suitable for embankment slopes	Nutrient interception, supports soil microbes	Prevents gully formation during monsoon flows

Zone	Width	Species name	Relevance to Rapti / Rohini Context	Pollution Control Function	Flood Control Function
		Pongamia pinnata (Karanj)	Performs well in alluvial basin soils	Agrochemical uptake, nitrogen-fixing	Strengthens banks during prolonged saturation
		Cassia fistula (Amaltas)	Suitable near settlements and river edges	Enhances microbial pesticide breakdown	Canopy reduces storm runoff concentration
		Jatropha curcas (Jatropha)	Tolerant to poor soils near fields	Uptake of heavy metals & pesticides	Reinforces bunds and embankments
Zone 3 – Native Trees (Outer Buffer / Upland Zone)	**30-50 m**	*Terminalia arjuna* (Arjun)	Traditionally used along riverbanks	Strong nitrate uptake, stabilizes banks	Buttressed roots resist major flood events
		Syzygium cumini (Jamun)	Suitable for moist alluvial terraces	Reduces nutrient leaching to groundwater	Enhances infiltration, moderates peak runoff
		Ficus religiosa (Peepal)	Long-lived native species	Supports nutrient cycling & soil microbes	Improves soil structure and moisture holding
		Albizia lebbeck (Siris)	Suitable for agro-forestry buffers	Nitrogen uptake, soil improvement	Spreads floodwater, reduces erosive force
		Bamboo spp. (Bamboo)	Grows well on floodplain margins	Excellent nutrient sink, rapid biomass	Dense clumps act as natural flood barriers

Expected outcome

Before intervention, the riverbank is bare, eroded, and has minimal vegetation, after implementing the proposed zonal riparian intervention, the degraded stretches of both rivers will be transformed into a continuous and dense green buffer. Grasses, shrubs and native trees will work together to stabilize the riverbanks, reduce flood impacts and improve water quality. This intervention will also enhance biodiversity along the river corridor. The before and after intervention conditions are illustrated in the image below.

Image 6-20: Conceptual representation the riparian buffer intervention

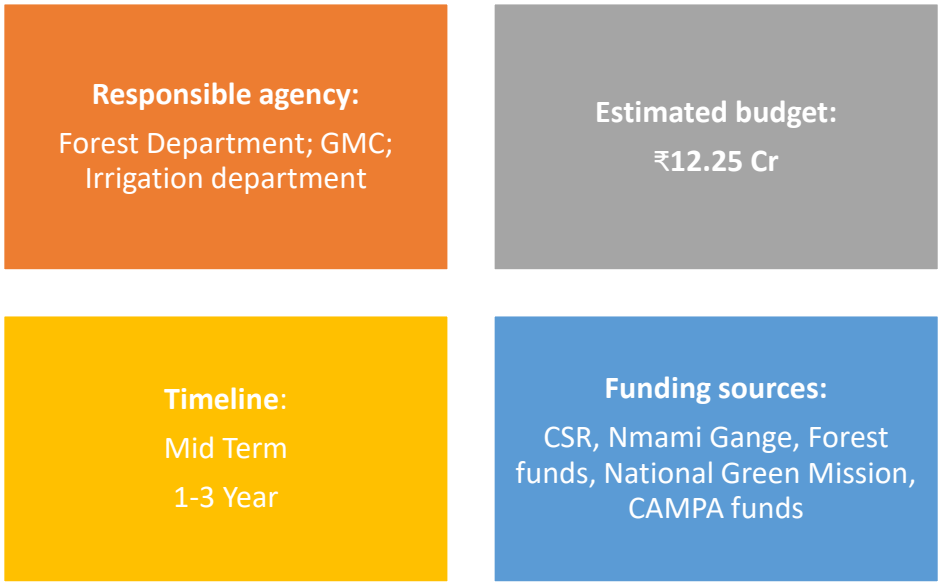
6.5.2 Recommendation 1: Conservation and Preservation of Natural dense riparian buffer along Rapti and Rohini Rivers

The table below presents the key management actions proposed for the existing riparian buffer along the Rapti and Rohini Rivers. These measures prioritize conservation of healthy stretches, restoration of degraded banks and targeted interventions to maintain ecological stability and long-term river resilience.

Recommendation for existing riparian stretch conservation and preservation
Well-developed, ecologically functional riparian vegetation that must be preserved in its current state. The key recommended actions are given below: • Integration of buffer width into flood plain zoning regulations. • Prohibited Permanent construction mining, dumping and river bank encroachment. • Control agricultural and domestic pollution sources along the Rapti and Rohini river corridors to protect water quality and improve ecosystem health. • Control grazing and fencing in sensitive stretches. • GIS based demarcation and geo fencing of buffer stretches. • Periodic drone and satellite monitoring. • Formation of Community level protection committee. • Penalty, restoration liability and compensatory plantation for violation.

Implementation Plan:

The implementation of the riparian buffer restoration along the Rapti and Rohini Rivers will be guided by a clearly defined management framework to ensure effective execution, accountability and resource utilization. Key elements of the framework include:



This framework provides a structured approach to restoration, integrating technical measures with administrative coordination and financial planning. By clearly defining responsibilities, budget, timeline and funding mechanisms, it ensures that the riparian buffer restoration is implemented efficiently, sustainably and in alignment with broader environmental and river management objectives.

6.6 Objective 5 Intervention for reuse of treated used water

6.6.1 Intervention 13: Enhance the reuse of treated used water in the city

At present, Gorakhpur generates 133.79 MLD of sewage, of which 44.50 MLD is treated through existing three Sewage Treatment Plants (STPs) with an installed capacity of 60 MLD. The treated effluent from these plants is currently discharged into the Rapti River, Rohini River, and Ramgarh Tal, with no formal reuse mechanism in place.

Under the ongoing and proposed sewerage projects, an additional four STPs with a cumulative capacity of 122 MLD are under construction/planning stage. Upon completion, the total sewage treatment capacity in Gorakhpur will increase to approximately 255 MLD, enabling treatment of the entire existing sewage load and accommodating future growth.

Analysis of outlet water quality from the existing STPs indicates that parameters such as pH, BOD, COD, and Total Suspended Solids are within the prescribed limits for discharge and are compliant with the CPCB Draft Recycled Water Guidelines for non-potable applications.

With appropriate distribution and storage infrastructure, the treated used water both current (44.50 MLD) and future (post-commissioning of under-construction STPs) can be safely utilised for landscaping, fire-fighting, and other approved non-potable purposes, significantly reducing freshwater abstraction and pollutant discharge into natural waterbodies.

Proposed Intervention:

The proposed intervention focuses on utilizing treated effluent from the **under-construction 38 MLD Sewage Treatment Plant (STP)** for beneficial reuse within nearby organised green areas and flow of treated water in the starting point of Gurdahiya nallah, taking advantage of spatial proximity and existing demand.

Proposed Reuse Components

1. **Reuse in Railway Golf Ground**

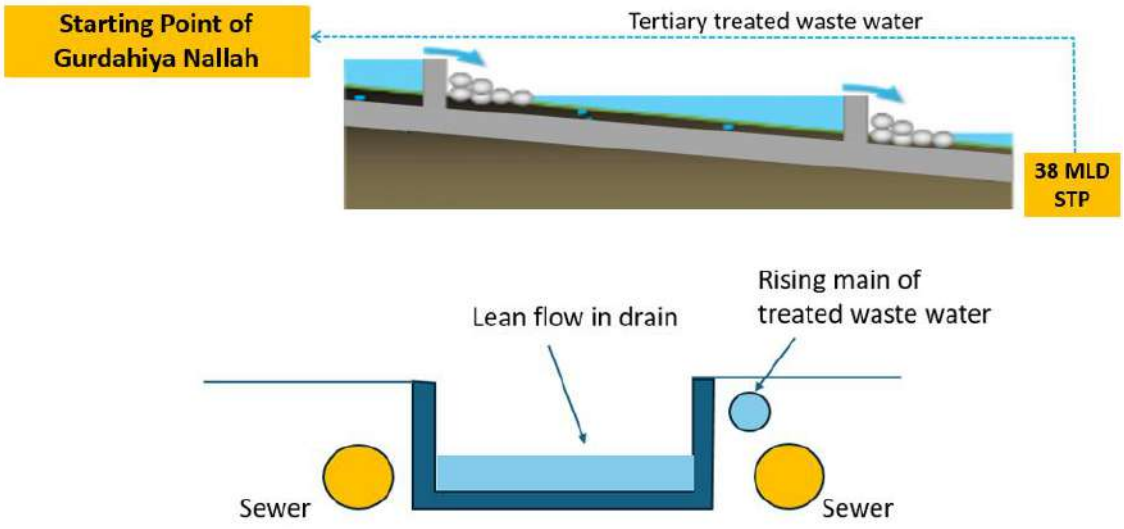
- Approximately **1.77 MLD of treated used water** from the 38 MLD STP is proposed to be diverted for horticulture of the **Railway Golf Ground and Organised Green areas** having 29.5 Ha of land located in close proximity of the STP refer Map 7-6.

This will replace freshwater usage for turf irrigation and ensure year-round maintenance of green cover.

Map 6-5: Proposed reuse of treated used water from 38 MLD STP in various organized greens in close proximity

2. Environmental Flow Support to Gurdahiya Nallah

- A portion of treated used water is proposed to be discharged into Gurdahiya Nallah to maintain minimum lean-season flows estimated at approximately 20 MLD, thereby improving channel health, reducing stagnation, and enhancing self-purification capacity during dry periods. To achieve this, the treated effluent shall be pumped upstream for a distance of approximately 9 km along the channelised stretch of the nallah, ensuring distributed flow augmentation and avoiding localised discharge impacts.



Map 6-6: Proposed reuse of treated used water in starting of Gurdahiya Nallah

Infrastructure and Implementation Approach:

- Development of a **pipeline** and pumping station from the 38 MLD STP to identified reuse sites.
- Adoption of **CPCB Draft Recycled Water Guidelines** to ensure safe reuse

Implementation Framework:

Responsible agencies:
Jal Nigam Urban; GMC; North Eastern Railway-Gorakhpur

Estimated budget:
₹20.2 Cr

Timeline:
Short term
1- 1.5 Years

Funding sources:
AMRUT, NMCG, State Urban Development Funds

6.7 Objective 7 interventions to develop eco-friendly riverfront projects and economic potential

6.7.1 Intervention 14: Develop an eco-friendly riverfront at Ekla Bandha

Rationale: The Ekla Bandha site on the western bank of Rapti River, south of the Gorakhpur – Varanasi Highway was a major site for municipal solid waste. However, GMC has conducted a massive sanitation campaign and is in the process of clearing entire legacy waste from this disposal site. GMC now plans to develop the site as a riverfront development along a stretch of approximately 1.1 km length and area of 44 ha (approx).

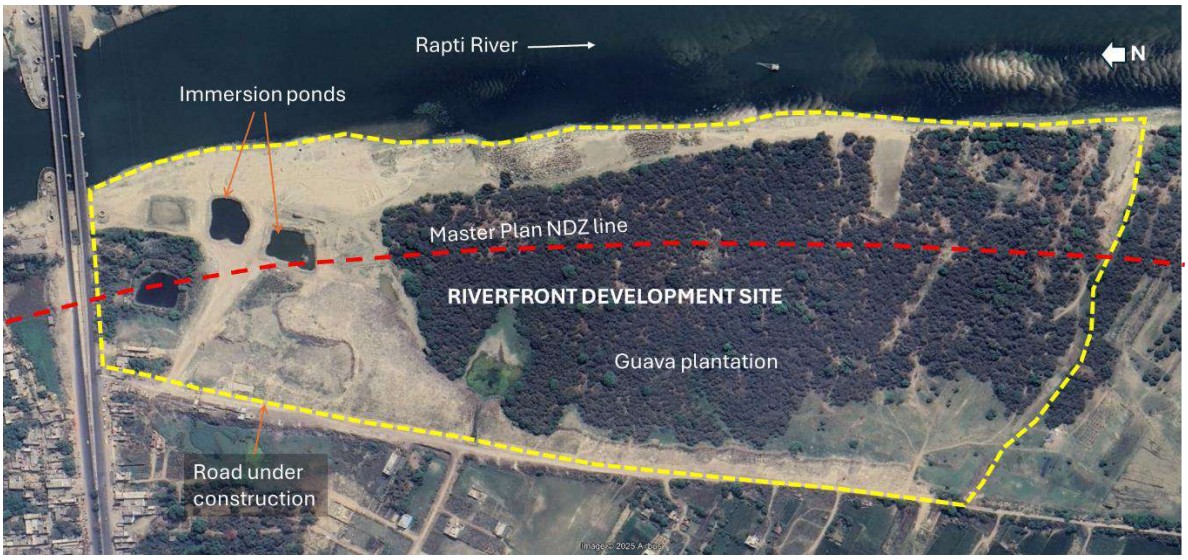


Image 6-21: Ekla Banda Riverfront Development site

Presently the northern part of the site is used for immersion of idols during festivals and has a few immersion ponds. The remaining part of the site has guava plantation which covers nearly three fourth area of the entire site.

Image 6-22: Immersion ponds and guava plantation at the Ekla Bandha site

Works being undertaken at the site presently comprises road works along the 1.1 km western edge of the site, plantation along the road, a small cafeteria on the road edge and stone pitching along edges of a pit within the site.

Image 6-23: Roadworks and stone pitching works at the Ekla Bandha site

Intervention: The GMC has not formulated any site plan for riverfront development of this stretch. This provides an opportunity to lay down eco-friendly principles of site planning, including selection of activities based on flood plain zoning.

The relative difference in elevation from the river edge (eastern edge of the site) to the top of the road under construction (western edge of the site) is 4m. In the absence of 25 year and 100-year return period lines, the Master Plan No Development Zone line passing through the site has been used to divide the site into three parts as follows:

- **Zone A (0 to 1.5m):** This stretch along the river edge and falls within the flood prone and Master Plan–designated No Development Zone (NDZ). This zone is intended to remain largely undisturbed to preserve natural river dynamics and flood conveyance capacity. Proposed uses are limited to soft, permeable interventions such as sandy river beach, immersion ponds for religious activities, and permeable paved areas to facilitate controlled vehicular movement during immersion events. No permanent structures are proposed in this zone.
- **Zone B (1.5 to 3m):** This stretch acts as a transitional buffer between the active floodplain and the urban edge along the new road. Recreational and ecological landscape features such as landscaped terraces, gentle earth mounds, open-air amphitheatre, nature trails, jogging tracks, and picnic groves are proposed here. Planting shall comprise guava plantations and other flood-tolerant native species, allowing periodic inundation without structural damage. This zone enhances public access to the river while dissipating flood energy and strengthening riparian ecology.
- **Zone C (3 to 4m):** Forms the interface between the riverfront and the adjoining urban areas. This zone accommodates urban support facilities such as a cafeteria, parking areas, and basic visitor amenities. Development in this zone is designed with permanent structures located outside flood-prone areas, ensuring minimal impact on the river system. Zone C supports visitor management and activates the riverfront while maintaining clear separation from ecologically sensitive zones.

Image 6-24: Cross section of Ekla Bandha Riverfront Site showing the various zones

Map 6-7: Proposed components of Ekla Bandha Riverfront Park

Implementation Framework:

Responsible agency: GMC, Tourism Department	**Estimated budget:** ₹43.35 Cr (subject to DPR)
Timeline: Short term 1-2 Year	**Funding sources:** AMRUT 2.0, NMCG, State Budget Allocations, Uttar Pradesh Tourism Department Grants, CSR

Refer Annexure 5 for detailed estimates.

6.7.2 Intervention 15: Integration of Raj Ghat, Ram Ghat and Ekla Bandha riverfront developments

Rationale: The Raj Ghat on (eastern bank), the Ram Ghat (western bank) and the proposed Ekla Bandha riverfront (western bank) are in proximity on either side of the Rapti River. It is reported that there are low footfalls at these locations and introduction of new activities can draw city residents to these locations and help in leveraging the economic potential of the Rapti River.

The following responses were received during field visits are as follows:

- The sites are located at western outskirts of Gorakhpur city in comparison to Ramgarh tal located in the heart of the city. Further, Ramgarh Tal provides a more wholesome waterfront experience consisting of boating, children's play areas, photography spots, light and sound show, etc. along with nearby attractions like Buddha Museum and Veer Bahadur Singh Planetarium.
- Presently, only children from nearby areas come here to play as activities such as evening aarti, boating, etc. that have been discontinued.
- Shifting of cremation activities from river edge to the crematorium premises of Rajghat will improve its attractiveness for other uses.

Intervention: Key interventions identified for enhancing the attractiveness of above-mentioned cluster of river front developments are as follows:

- Integration of the three riverfront sites
- Interventions at Raj Ghat
- Interventions at Ram Ghat

Integration of the three river front sites: The sites are proposed to be integrated through the following measures:

- River Circuit through small electric boats or ferries joining the loop comprising Ram Ghat, Ram Ghat and Ekla Bandha
- Establishing a visual axis using similar complementary lighting across the river. Lighting the underneath of the bridge can be included as a unifying element between the two banks of Rapti.
- Planting similar trees and shrubs at all the three locations to unify them as part of one riverfront project.

Interventions at Raj Ghat: Due to the presence of crematorium at Rajghat it is proposed to be promoted as a passive contemplative zone. The following interventions are suggested:

- Restricting cremation on the river edge and promoting the existing crematorium as a green crematorium based on gas or electricity with high chimneys to eliminate smoke to make the adjacent riverfront more usable for public.
- Establishment of a Smriti Van (Memorial Forest) from the vacant stretch north of Rajghat at the outfall of Takiya ghat Nallah and extending it southwards to the Amrud Bagh from underneath the Varanasi-Gorakhpur expressway Rapti River bridge. The concrete platforms of the ghat are proposed to be softened by creating dense, landscaped vegetation to establish this connection by planting sweet-smelling trees like Champak and Parijat to mask odors and create a serene environment in upper terraces.
- Flood-Resilient Planting are proposed on the lower terraces to survive submersion during monsoons & provide shade during summer comprising flood-tolerant trees like Arjun, Jamun and Barringtonia.
- Sections of this riverfront park may be dedicated to prominent figures of the city such as Ram Prasad Bismil, Babu Bandhu Singh, Digvijayanath, etc.

Image 6-25: Rajghat to be extended with path and green elements till Takiya Ghat Nallah

Image 6-26: Rajghat to be developed as contemplative zone with plantation themes

Interventions at Ram Ghat: The Active Zone

- Culture, Rituals, Tourism, Crowds
- Signature "Rapti Aarti": Choreographed, daily evening Rapti Aarti
- Projection Mapping: Use projection mapping on the water spray or on the temple facades at the ghat to tell the story of Gorakhnath and the Rapti river
- River Activities: Introduce Shikara-style boating with story telling
- Link Ram ghat to the Ekla ghat river front to the south from below the road bridge

Image 6-27: Light and sound show with religious theme at Ramghat

Implementation Framework:

Responsible agency: GMC, Tourism Department	**Estimated budget:** ₹18.19 Cr (subject to DPR)
Timeline: Short term 1-2 Year	**Funding sources:** AMRUT 2.0, NMCG, State Budget Allocations, Uttar Pradesh Tourism Department Grants, CSR

Refer Annexure 6 for detailed estimates.

6.7.3 Recommendation 2: Modify design of Eco-Sponge Park at Mahesara Tal/Chillua Tal to include nature based and flood sensitive designs

Rationale: Gorakhpur Municipal Corporation is in the process of designing an Eco-sponge Park at Mahesara Tal. The site is reported to be flood prone. The design takes into consideration the slope of the land. However, the placement of key design elements based on extent of flooding in the site is not specified. Further, it is reported that land filling to the extent of 2.5m is proposed in the site which would contribute to reduction in the capacity of the lake to store storm water.

Image 6-28: Present design of Eco-sponge park

Image 6-29: Northern part of the site is reported to be flood prone

Modifications: In view of the above, recommendations to modify the design to include nature based and flood sensitive features have been proposed. A terraced design with three zones at varying distances from the water edge is proposed, based on frequency of flooding experienced by the site.

- **Zone A:** Flooding zone comprising immediate water edge designed as first line of defence against rising water levels. It features bioengineered gabions and Vetiver grass to stabilize the bank and prevent soil erosion. Low-impact, water-resilient activities such as fishing decks are proposed here.
- **Zone B:** Ephemeral Zone comprising buffer and transition area that is dry most of the time but expected to flood during seasonal highs. It features durable materials like stone or treated timber that can withstand being submerged without sustaining damage. Temporary or seasonal activities like seasonal markets (Haat), which can be moved if flood warnings are issued are proposed here.
- **Zone C:** Dry Zone comprising the protected area that is furthest from the water and sits on higher ground and intended for permanent infrastructure requirements of the park. Stilt architecture, where structures are elevated on pillars 1.5m to 3m high rather than solid plinths are proposed here. This allows extreme floodwaters to freely flow underneath buildings without damaging property. Permanent cafes, museums, and parking located beneath the stilted buildings maybe located in this zone. Miyawaki forest maybe located this zone or at the upper transition edge of Zone B comprising flood-tolerant species such as *Terminalia arjuna*, *Barringtonia acutangula*, *Salix tetrasperma*, etc.

Cross section of the modified design of the park with location of the three zones is presented Image 6.30. below for reference. A visual representation of the modified sponge-park is presented in image 6.31.

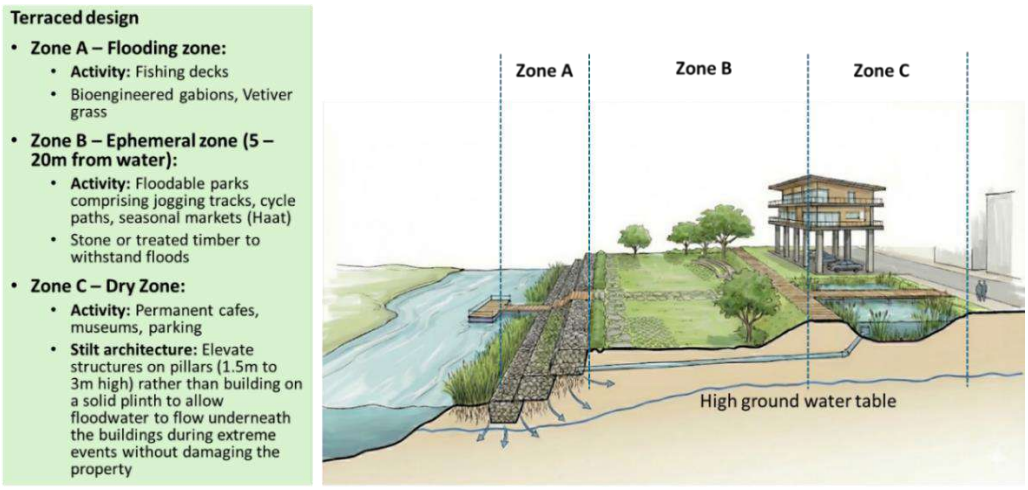


Image 6-30: Cross section of modified design of Sponge-Park at Mahesara Tal

Image 6-31: View of proposed Sponge-Park at Mahesara Tal

6.8 Objective 8: Recommendations to leverage the economic potential of the river

Economic interventions for leveraging the economic potential of Rapti and Rohini rivers & the major waterfronts in the city Gorakhpur has been identified based on existing developments and interventions proposed as part of this URMP report.

6.8.1 Intervention 16: Riverfront Tourism & Recreation

Rationale

The Rapti and Rohini rivers are central to Gorakhpur's cultural identity, yet they remain underutilized compared to Ramgarh Tal, which already attracts high footfall through boating, light shows, and cultural events. Raj Ghat and Ram Ghat currently see limited visitors, mostly ritual users or local children, as activities like evening "Raapti-Aarti" and boating have been discontinued. The riverbanks are flood-prone, unmanaged seasonal use often leads to waste accumulation, and the absence of structured tourism infrastructure reduces attractiveness.

Reviving cultural rituals, introducing eco-tours, and creating seasonal recreational spaces can diversify tourism flows, reduce pressure on Ramgarh Tal, and generate sustainable livelihoods for local communities.

Implementation

- Daily "Raapti-Aarti" at Ram Ghat with guided heritage walks to Gorakhnath Temple.
- Projection mapping on temple facades to narrate river heritage.
- Birdwatching eco-tours led by trained boatmen.
- Seasonal floating markets post-monsoon and weekly flea markets in dry terraces.
- Adventure recreation: cycling tracks, jogging trails, amphitheatre events at Ekla Bandha.

Value Addition

- **Cultural revival:** Restores rituals and heritage practices, strengthening Gorakhpur's identity.
- **Tourism diversification:** Attracts visitors beyond Ramgarh Tal, balancing city tourism flows.
- **Livelihood creation:** Provides structured income for boatmen, artisans, and vendors.
- **Flood resilience:** Activities sited in flood-safe terraces, ensuring continuity despite seasonal inundation.

Implementation Framework:

Responsible agencies:
GMC (Lead), Tourism Department, SHGs, NGOs

Estimated budget:
First-year cost: ₹0.12Cr
Annual recurring cost: ₹0.08Cr

Timeline:
Short term
1.5 - 2 Year (in alignment with projects under Objective 7 & 2)

Funding sources:
Municipal sanitation budget, CSR (local industries), temple trusts, IEC (Namami Gange)

6.8.2 Intervention 17: Value Addition to River Resources

Rationale

The Rapti–Rohini basin's fertile silt, sandy floodplains, and invasive hyacinth are currently treated as waste or exploited informally. Terracotta artisans face irregular clay supply, Diara farmers suffer post-harvest losses, and hyacinth infestation worsens biodiversity loss. Riverbed material (RBM) is extracted informally, and ritual practices generate pollution. Structured value chains can convert these challenges into economic opportunities, while simultaneously improving ecological health.

Implementation

- Establish clay processing hubs to filter/pug dredged silt for standardized terracotta supply.
- Organize riverbank farmers into agro-cooperatives with packaging centers.
- Monetize hyacinth through Bio-CNG (Ramgarh Tal) and boutique crafts + briquettes (Chillua Tal).
- Train SHGs/artisans in RBM stone crafting for benches, signage, kiosks, paving.
- Produce biodegradable ritual kits for Raj Ghat and Ekla Bandha.

Value Addition

- **Clay:** "Rapti River Clay" strengthens terracotta industry, monetizes dredging, and supports artisans.
- **Agriculture:** "Organic Riverbed Vegetables" branding improves farmer income and reduces wastage.
- **Hyacinth:** Converts nuisance weed into energy, crafts, and eco-products, turning an ecological challenge into livelihoods.
- **RBM:** Adds cultural branding to riverfront infrastructure, reducing informal extraction.
- **Rituals:** Eco-friendly kits reduce pollution while creating seasonal income streams.

Implementation Framework:

Responsible agencies: GMC, Tourism Dept., SHGs, NGOs, GDA	**Estimated budget:** First-year cost: ₹0.15Cr
Timeline: Short term 1.5 Year	**Funding sources:** IEC budgets, CSR (banks, industries), RWAs, UPNEDA, PPP

6.8.3 Intervention 18: SHG-Operated Kiosks

Rationale

Self-Help Groups (SHGs) in Gorakhpur have demonstrated capacity for crafts and entrepreneurship but lack structured support. Ritual practices generate pollution, while local cuisine (guava-based products, sweets) remains under-promoted. Hyacinth removal is sporadic, treated as waste, and SHGs are not yet integrated into riverfront economies.

Implementation

- SHGs convert hyacinth into eco-products (Rapti Eco Boutique).
- SHGs produce biodegradable ritual kits.
- Eco-cafes serving guava-based products and traditional sweets; seasonal guava festivals at Ekla Bandha.

Value Addition

- **Empowerment:** SHGs gain structured, sustainable livelihoods.
- **Pollution reduction:** Eco-friendly ritual kits reduce immersion-related pollution.
- **Food culture:** Promotes guava-based products and traditional cuisine, linking agriculture to tourism.
- **Visibility:** Kiosks provide high-visibility retail platforms for local crafts and produce.

Implementation Framework:

Responsible agencies: GMC, Tourism Dept., SHGs, NGOs, GDA	**Estimated budget:** First-year cost: ₹0.15Cr
Timeline: Short term 1.5 Year	**Funding sources:** IEC (Namami Gange), CSR (railways, industries), DAY NULM for SHG skilling

6.8.4 Intervention 19: Boating Economy at Raj Ghat

Rationale

Boating at Raj Ghat is informal and unsafe, while Ramgarh Tal has structured boating. Local boatmen face declining incomes. Raj Ghat's proximity to cultural hubs makes it ideal for thematic boating, but infrastructure is absent. Formalizing boating can stabilize livelihoods, enhance tourism appeal, and embed cultural branding.

Implementation

- Introduce shikara-style boating with storytelling.
- Festival/event boating with decorated boats.
- Establish boat design & crafting workshops for cultural motifs.

Value Addition

- **Livelihoods:** Provides stable income for boatmen and carpenters.
- **Tourism appeal:** Enhances visitor experience with cultural branding.
- **Seasonal demand:** Creates additional income for artisans and SHGs during festivals.
- **Safety:** Modular floating jetties and boats (Hybrid/Electric) equipped with safety equipment and life jackets to ensure safe boarding and flood resilience.

Implementation Framework:

Responsible agencies:
GMC, Temple Committees, SHGs, NGOs

Estimated budget:
First-year cost: ₹0.12Cr

Timeline:
Short term
1.5 Year

Funding sources:
Municipal sanitation budget, CSR (local businesses), temple trusts, IEC (Namami Gange)

6.8.5 Intervention 20: Workforce Training for New River-Based Economies

Rationale

Flood vulnerability compounds livelihood insecurity. Traditional skills (terracotta, fishing, carpentry) are under pressure from modern market demands. SHGs and vocational institutes exist but lack alignment with river-based economies. Targeted training can modernize crafts, build flood resilience, and diversify income streams.

Implementation

- Train youth as Aapda Mitra cum eco-guards.
- Establish Green Maintenance Corps for embankment stabilization and dredging.
- Certify adventure tourism guides for boating, cycling, eco-trails.
- Train artisans in RBM stone crafting and masonry.
- Build capacity in riparian ecology and recharge techniques.
- Train SHGs in eco-product design, branding, flood-resilient kiosk operations.
- Modernize terracotta design and marketing with digital tools.

Value Addition

- **Dual-role employment:** Ensures year-round engagement (rescue + eco-guiding).
- **Craft modernization:** Links terracotta and RBM products to global markets.
- **Local contracting:** Keeps flood-control funds within the local economy.
- **Tourism diversification:** Expands guiding and eco-tourism opportunities.
- **SHG resilience:** Builds adaptive business models for seasonal flooding.

Implementation Framework:

Responsible agencies:
GMC, ITI Gorakhpur, Gorakhpur University, vocational institutes

Estimated budget:
Training program costs integrated with DAY NULM and Tourism Department grants.

Timeline:
Short term
6 months

Funding sources:
DAY NULM, Tourism Department grants, CSR

6.9 Objective 9 intervention to inculcate river-sensitive behaviour among citizens

The interventions under Objective 9 are designed to embed ecological awareness and cultural pride into everyday practices, ensuring citizens adopt river-sensitive behaviours. From interpretive signage and biodegradable ritual kits to electric crematorium promotion, digital IEC content and annual river festivals, these measures collectively strengthen emotional, cultural and behavioural ties with the Rapti and Rohini river. The detailed interventions are listed in the sections below.

Figure 6-5: River-sensitive practices and cultural awareness

6.9.1 Intervention 21: Interpretive Signage and QR-Coded Storytelling Boards at major public spots

The Rapti and Rohini river has a limited presence in daily urban life. Devotees gather along the banks of river to celebrate the festivals. As people majorly visit ram ghat, raj ghat and crematorium. Current IEC initiatives are confined to city-wide awareness under the Swachh Bharat Mission 2.0 but there is no dedicated river-focused signage or digital platforms. As a result, several critical gaps have been identified:

a. Absence of river-centric IEC infrastructure such as interpretive signage, kiosks, or digital channels.

b. Lack of cultural and biodiversity storytelling platforms to highlight the river's heritage and ecological significance.

c. Minimal citizen engagement beyond sanitation campaigns, leaving broader participation and stewardship opportunities untapped.

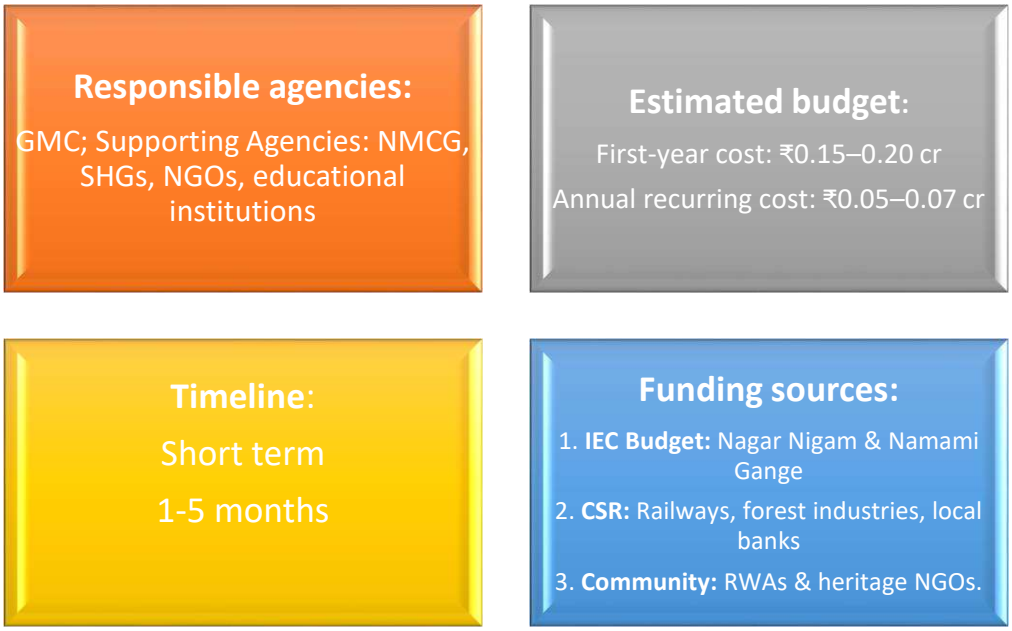
Proposed Intervention:

- **Installation of Interpretive Boards:** Approximately 20–25 multilingual boards shall be placed at strategic public locations, including ghats, bridges, parks, bus stand approach roads and temple.
- **Visual Storytelling:** Each board shall integrate visual storytelling elements such as folklore, biodiversity, river history, enabled with QR codes that shall be linked to digital content like

heritage stories, conservation tips, citizen pledges platforms, etc. at raj ghat, ram gaht and Ramgarh tal and chiluva tal. The content material shall be refreshed annually to maintain relevance and encourage repeat engagement.

- **Participation Tracking:** QR code analytics will be monitored by GMC to assess levels of citizen interaction and participation.
- **Community Engagement:** Local schools, Resident Welfare Associations (RWAs), and NGOs shall be actively involved in developing content, fostering community ownership and sustained engagement.

Implementation Framework:



6.9.2 Intervention 22: Distribution of Biodegradable Offering Kits at Sacred Sites in Gorakhpur City

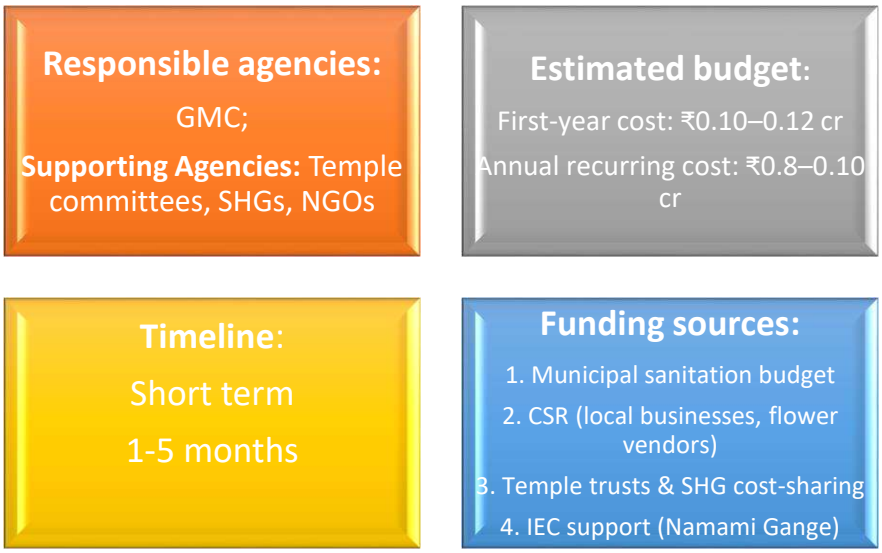
Ritual practices along the Rapti and Rohini River, such as flower offering during major festivals, aarti & puja. Open cremations are carried out on the Rapti riverbed near Rajghat, results in the disposal of ash, ritual waste and partially burnt remains directly into the river. It contributes notably to the degradation of water quality of rivers. In addition to this, ritual activities often involve the use of plastic-based materials, synthetic fabrics and non-biodegradable packaging, which accumulate along the riverbanks. Seasonal peaks during festivals intensify the inflow of such materials, creating visible waste deposits and pollution.

Proposed Intervention:

- **Biodegradable Ritual Kits**: Introduce kits comprising dried flowers, tulsi leaves, and compostable containers as sustainable alternatives to plastic-based offerings majorly at raj ghat, ram ghat and sacred places along the rivers.
- **Distribution Channels:** Ensure availability through temples, Self-Help Group (SHG) kiosks, municipal counters, cremation ghats and in major festival congregation points such as the Kartik Purnima, Ram Navami and Chhath Puja sites.

- **IEC Activities:** Promote ecological values embedded in religious practices through targeted Information, Education, and Communication (IEC) campaigns, with slogans prominently displayed at distribution points.
- **Awareness and Advocacy:** Conduct awareness drives in collaboration with priests and temple committees to encourage adoption among devotees.
- **Community Participation:** Train SHGs to prepare and package kits, thereby fostering livelihood opportunities and strengthening community ownership.
- **Monitoring and Evaluation:** Municipal staff will monitor kit usage during festivals to assess reductions in plastic waste and track behavioral change.

Implementation Framework:



6.9.3 Intervention 23: Awareness and utilization campaign for promoting the use of existing electric crematorium facility at Raj Ghat

The Gorakhpur Municipal area currently operates Ram Dutt Mishra Ghat and Shahara Vaikunta Dham cremation grounds. However, due to prevailing religious beliefs and long-standing traditions, majority of the local community continues to prefer the traditional wood-based cremations in the open cremations on the Rapti riverbed near Rajghat.

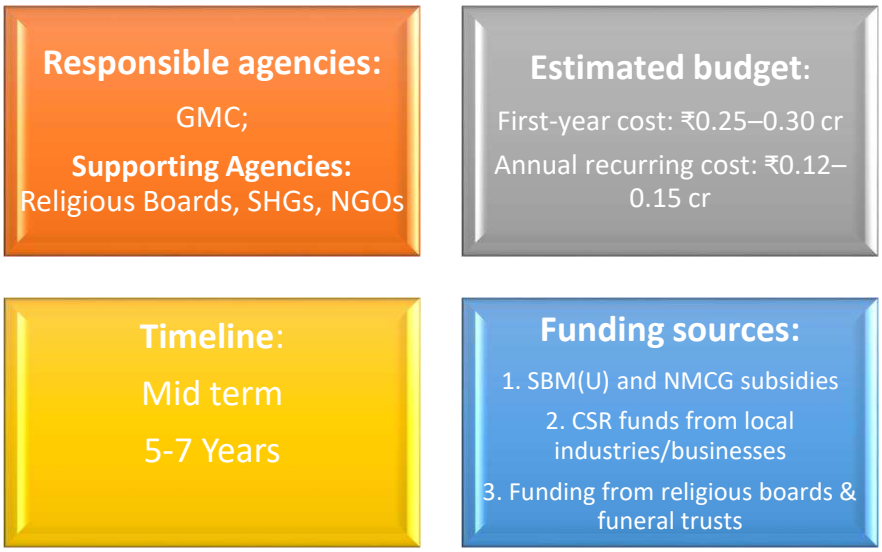
Post-cremation remains such as ashes, flowers and ritual offerings are routinely deposited into the river, contributing to water pollution. Despite the availability of electric cremation facilities, citizens remain largely unaware of the subsidies offered and the ecological benefits associated with their use.

Proposed Intervention:

- Promote electric crematoriums as sustainable alternatives to traditional wood-based practices, emphasizing their ecological and health benefits.
- Establish formal MoUs with religious boards and cremation committees to secure institutional support and foster wider community acceptance.
- Organize quarterly workshops with priests, elders, and funeral service providers to build awareness and dialogue around environmental and public health impacts.

- Implement targeted IEC campaigns using posters, short videos, and testimonials from families who have adopted electric cremation, to normalize and humanize the practice.
- Conduct awareness drives to disseminate clear information on available subsidies, municipal support schemes, and long-term cost savings.
- Recognize and empower community leaders as "Eco-Cremation Champions" to serve as trusted advocates and role models for sustainable practices.

Implementation Framework:



6.9.4 Intervention 24: Organizing community-led solid waste clean-up campaigns along nallahs and riverbanks

Refer section 4.4 on solid waste management. It was observed that large amounts of waste including plastics, construction debris and organic material are dumped directly onto the floodplain and riverbanks from the areas of dense settlements at Domingarh bridge and Raj ghat. Also high amount of waste were dumping into the drains.

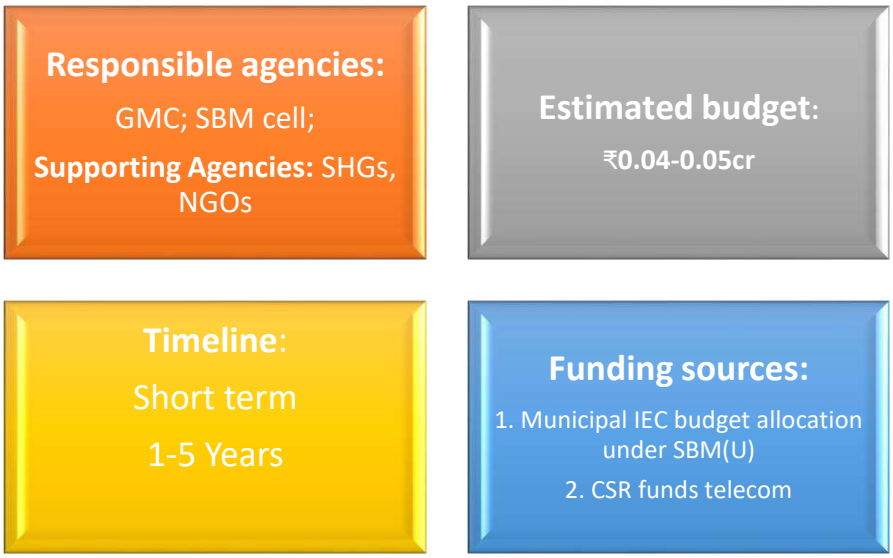
Furthermore, the SBM Cell of Gorakhpur actively manages a network of over 175 Swacch Sarthi Clubs, which serve as the frontline for community-driven sanitation efforts. The city's IEC team leverages this infrastructure to drive impactful behavioral change by encouraging residents to donate household items like clothes, toys, and books through dedicated collection drives. The IEC team lacks in river - oriented intiatives.

Proposed Intervention:

- Deploy ward-level monitoring teams to prevent dumping on floodplains and riverbanks.
- Install CCTV cameras and community reporting mechanisms at Domingarh bridge and Raj Ghat
- Establish designated waste collection points near dense settlements to reduce direct dumping.
- Mandate contractors to dispose of debris at authorized sites with penalties for violations

- Engage Swacch Sarthi Clubs to adopt drains in their localities, reporting blockages and illegal dumping.

Implementation Framework:



6.9.5 Intervention 25: Annual Celebration of "River Utsav"

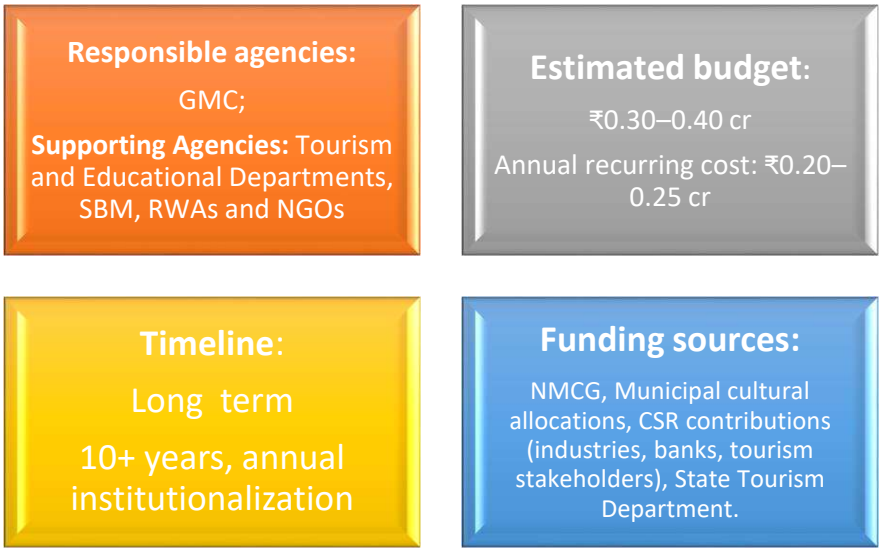
Festivals like Chhath Puja and Makar Sankranti nurture deep emotional and cultural ties with rivers, underscoring their central role in community life. To transition this deep-seated community reverence into a permanent civic duty, the IEC team has institutionalized the celebration of International River Day. This strategic intervention serves as a formal "cultural anchor," bridging the gap between traditional worship and modern ecological stewardship. By leveraging this global platform, the city promotes year-round environmental responsibility, ensuring that river conservation evolves from a seasonal activity into a mainstream component of Gorakhpur's urban identity and citizen engagement framework.

Proposed Intervention:

Interventions	Implementation Roadmap
• Organizing "River Utsav" aligned with Makar Sankranti Mela and chhath puja to institutionalize cultural pride around the river	1 Year
• Launching of activities such as river walks, folk performances, eco-art exhibitions, school competitions and IEC booths to.	
• Showcasing river-themed initiatives by schools, SHGs, RWAs and NGOs. • Initiate annual documentation of the festival will be shared with schools and community groups to sustain visibility.	
• Expansion of participation by formalizing partnerships with schools, RWAs, SHGs and NGOs.	2-3 Years
• Institutionalization of annual competitions for citizen-created jingles, videos, and art, integrating winners into IEC campaigns.	
• Introduce youth-led storytelling and digital campaigns to foster peer-to-peer awareness.	
• Establish monitoring mechanisms to track reach, participation and ecological pledges.	

Interventions	Implementation Roadmap
• Formalize '**River Day**' as an annual municipal event, embedded in Gorakhpur's cultural calendar.	4-5 Years
• Scale up venues to include municipal parks and riverfront spaces for exhibitions and performances.	
• Position River Utsav as a **regional cultural anchor**, attracting visitors and reinforcing river identity.	
• Publish annual impact reports documenting participation, ecological outcomes, and cultural integration.	
• Recognize schools, RWAs, and community leaders as **"River Guardians"**, sustaining visibility and stewardship.	

Implementation Framework:



6.9.6 Intervention 26: Establishment of kiosks operated by Self-Help Groups (SHGs) at the Ram Ghat, Raj Ghat, Ramgarh Tal and Chillua Tal Lakefront

At present, commercial activity at Ram Ghat, Raj Ghat, and Chillua Tal Lakefront is largely restricted to temporary stalls and kiosks that appear only during festivals like Chhath Puja and other religious occasions. This seasonal approach creates a service gap, as the city currently lacks permanent outlets dedicated to offering eco-friendly ritual kits, local handicrafts and traditional refreshments.

Proposed Intervention:

- "River-Sourced" Handicrafts: Terracotta items (Gorakhpur's GI tag), hand-painted river stones, and eco-friendly idols for rituals.
- Biodegradable Offerings: "Puja Kits" containing biodegradable materials (no plastic), organic incense (Agarbatti), and flower-seed paper.
- Traditional Food Hubs: Local Gorakhpuri delicacies and seasonal refreshments (e.g., Sattu drinks, lassi) served in earthen "Kulhads" to minimize waste.
- IEC Knowledge Kiosks: Selling "River Passports" or guidebooks that educate visitors on the history of the Rapti river and Chillua Tal.

Implementation Framework:

Responsible agencies:
GMC;
Supporting Agencies: Temple committees, SHGs, NGOs

Estimated budget:
First-year cost: ₹0.10–0.12 cr
Annual recurring cost: ₹0.08–0.10 cr

Timeline:
Short term
1-5 months

Funding sources:
1. Municipal sanitation budget
2. CSR (local businesses, flower vendors)
3. Temple trusts & SHG cost-sharing
4. IEC support (Namami Gange)

6.10 Objective 10 Intervention to engage citizens in river management activities

Objective 10 focuses on active citizen participation and structured stewardship of the river. Through River Sabha Committees, creative competitions, street plays and clean-up drives, these interventions institutionalize community involvement, empower youth & residents and ensure accountability in river governance. Together, they transform citizens into custodians of river health and resilience. The detailed interventions are outlined in the following sections.

Figure 6-6: Citizen participation in river management

6.10.1 Intervention 27: Establishment of River Sabha Committees at the city level to promote participatory river governance

Community participation in river governance is fragmented, with limited institutional platforms for collective decision-making. As part of its ongoing commitment to urban cleanliness, the Gorakhpur Nagar Nigam has actively engaged with Resident Welfare Associations (RWA) and Bulk Waste Generators (BWG) to reform local waste management strategies. Through a series of 58 dedicated meetings, the municipal corporation has successfully sensitized 593 key beneficiaries on the importance of sustainable disposal practices. These sessions focused on fostering a sense of shared responsibility and encouraging direct collaboration between citizens and the municipality to achieve cleaner neighbourhoods.

The current environmental strategy emphasize the importance of source segregation through community-led initiatives; however, it also highlights the urgent necessity for more robust interventions to safeguard the city's rivers and waterbodies. Addressing this gap is a priority, as basic waste management to a holistic 'ridge-to-river' approach will actively prevents the pollution.

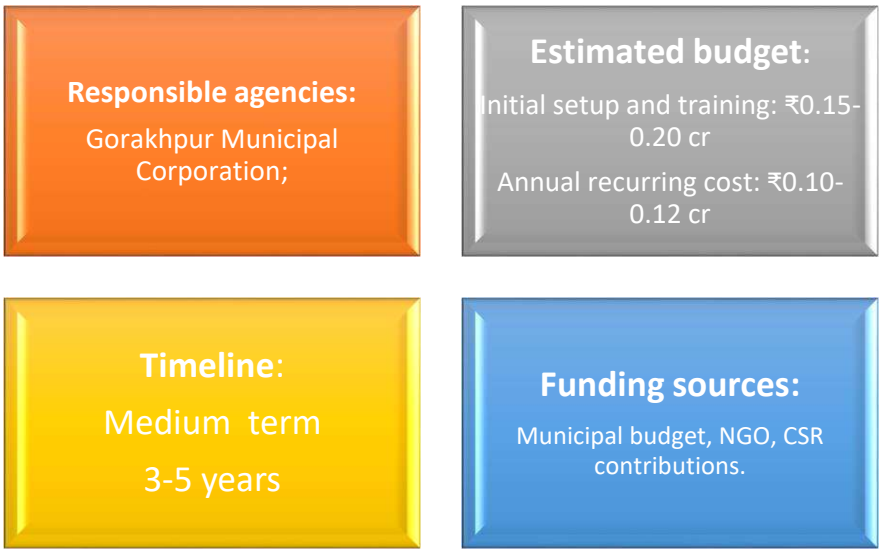
The baseline assessment highlights the following concerns:

1. Absence of a formalized citizen-led body to coordinate river stewardship and provide consistent environmental monitoring.
2. Limited accountability and transparency in the mechanisms for reporting solid waste dumping in nallahs and rivers.
3. Youth engagement remains inconsistent

Proposed Intervention:

- **Establishment of Multi-Tier Governance**: Establish River Sabha Committees at both city and ward levels, ensuring each tier has clearly defined roles and operational mandates.
- **Inclusive Stakeholder Representation**: Ensure a diverse composition within each committee by integrating representatives from Self-Help Groups (SHGs), youth leaders, Resident Welfare Associations (RWAs), and ward officials.
- **Enhanced Digital Accountability**: Formalize transparency by integrating committee reporting and monitoring data into the SBM (Swachh Bharat Mission) and URMP (Urban River Management Plan) dashboards.
- **Capacity Building for "Rohini and Rapti Guardians":** Train a dedicated volunteer force of " Rohini and Rapti Guardians" to spearhead community awareness initiatives, monitor environmental violations, and report illegal dumping.
- **Structured Youth Engagement**: Mobilize NSS and NCC units to conduct monthly riverbank clean-up campaigns, providing a consistent framework for youth-led environmental action.
- **Institutionalized Oversight**: Mandate quarterly review meetings to evaluate progress, facilitate communication with municipal authorities, and propose strategic corrective actions

Implementation Framework:



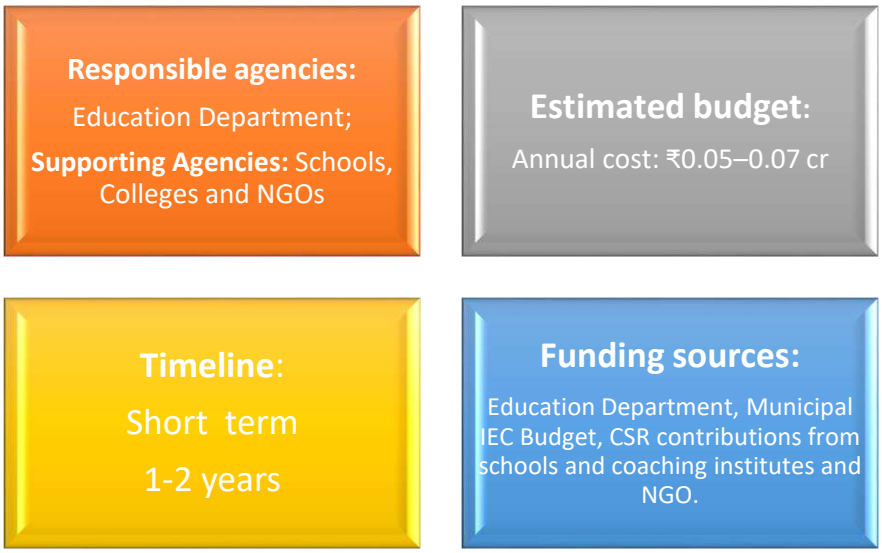
6.10.2 Intervention 28: Promote youth participation in conservation and awareness programs focused on both Rapti and Rohini River.

Schools and colleges currently conduct competitions, these initiatives remain generalized and lack specific themes centered on river conservation or wetland health. This absence of localized focus prevents students from developing a deep understanding of the city. Furthermore, the lack of structured institutional platforms restricts the ability of the youth to express creative ideas or propose innovative solutions for improving river health. Consequently, the baseline assessment highlights the need to transition from occasional environmental activities toward a more consistent, river-centric framework that empowers students as active contributors to the city's ecological restoration.

Proposed Intervention:

- Conduct quarterly competitions (poster-making, debates, essay writing) on themes such as "Waste-Free River" and "River is Life".
- Institutionalize competitions through Education Department circulars to ensure participation across schools and colleges.
- Winning entries will be displayed at River Utsav, municipal parks and public spaces to maximize visibility.
- Teachers and RWAs will be engaged as mentors to guide students in preparing entries.
- Annual compilation of best entries will be published as a booklet or digital showcase for wider dissemination.

Implementation Framework:



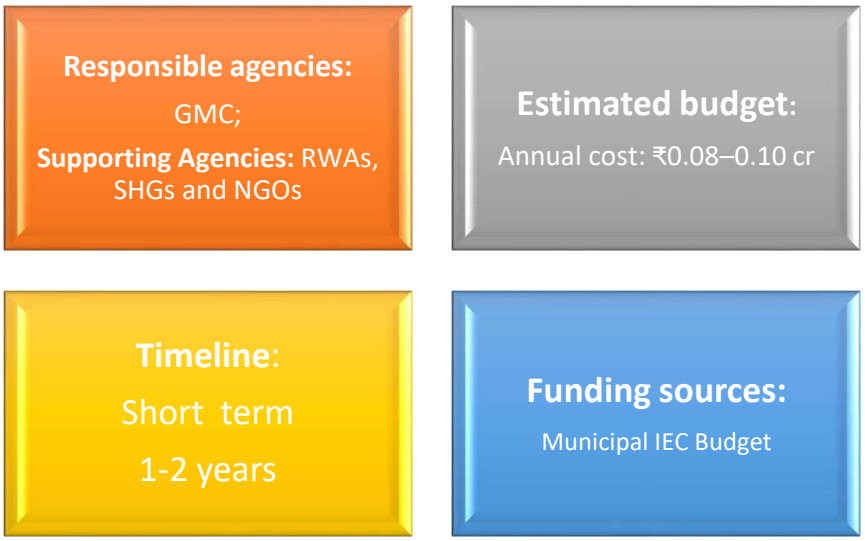
6.10.3 Intervention 29: Street Plays (Nukkad Natak) by RWAs &local community

The Street plays are a popular medium to highlight the concerns related to rivers. The city lacks in organizing street plays as the IEC campaigns rely heavily on posters and rallies in educational institutions.

Proposed Intervention:

- Train SHGs and RWAs to perform monthly Nukkad Nataks in dense settlements, markets and temple areas.
- Scripts will highlight river pollution, waste segregation and eco-spiritual values.
- Performances will be rotated across different wards to maximize reach.
- Plays will be aligned with festivals and market days for greater visibility.
- Municipal IEC cell will provide logistical support such as costumes, sound systems and publicity.
- Annual recognition will be given to the most impactful community performers to sustain motivation.

Implementation Framework:



6.10.4 Intervention 30: Engage Local Residents in River Clean-Up Drives

Currently the IEC activities include campaigns, clean up drives, plog run drives etc. The Riverbank clean-up interventions were not undertaken in the city. The baseline assessment highlights the following key concerns:

- Lack of regularity and institutional recognition.
- Limited visibility of citizen contributions.

Proposed Intervention:

- Conduct monthly clean-up drives led by SHG's and youth clubs.
- Activities will be reported through the SBM Swachhta App for visibility and accountability.
- Participants will be recognized through eco-leadership badges and certificates.
- RWAs and schools will be encouraged to adopt specific stretches of the riverbank for sustained engagement.
- Clean-up drives will be showcased during international river day and river Utsav to highlight citizen contributions.
- Municipal staff will ensure collected waste is properly segregated and disposed of through official channels.

Implementation Framework:

Responsible agencies:
River Sabha Committees;
Supporting Agencies: RWAs, SHGs and NGOs

Estimated budget:
Annual recurring cost: ₹0.12–0.15 cr

Timeline:
Short term
1-2 years

Funding sources:
1. Municipal IEC budget allocation under SBM(U)
2. CSR funds
3. Community contributions (RWAs)

Annexure

Annexure 1: Draft Scope of Work for Faecal Sludge and Septage Management (FSSM)

Objective: To undertake a comprehensive Sanitation Value Chain Assessment for Gorakhpur, evaluate the adequacy of ongoing sanitation infrastructure projects, and formulate a supplementary plan to bridge the gap between committed capacity and projected future demand, aligned with national SOPs and best practices in Uttar Pradesh & India.

1. Sanitation Value Chain Assessment

A. Containment

Structural Audit: Survey a representative sample (% in the 8 sewerage Zones of Gorakhpur) to determine the percentage of households with properly built septic tanks vs. single pits vs. direct discharge to drains.

- **Leakage & Groundwater Risks:** Assess water tightness, presence of baffles, and effluent pathways to identify risks of groundwater contamination.
- **Household Registry:** Develop a geo-tagged database of septic tanks, capturing tank size, **desludging** history, and effluent discharge points.

B. Emptying

Accessibility Mapping: GIS mapping of road widths to quantify households inaccessible to standard 3000L vacuum trucks, especially in dense unplanned colonies.

- **Mechanization Index:** Determine the ratio of mechanical emptying (vacuum trucks) vs. manual emptying.
- **Scheduled Desludging:** Assess current demand-based desludging practices and propose regulated cycles (3–5 years).

C. Transport

- **Fleet Assessment:** Document the number and capacity of government and private desludging vehicles (both GMC & Private).
- **Digital Tracking:** Introduce GPS-based monitoring and trip logs integrated into municipal dashboards.
- **Illegal Dumping Surveillance & Penalty:** Identify hotspots where sludge is discharged illegally into drains, open lands, or rivers. Imposing heavy penalty for illegal dumping.

D. Treatment & Disposal

- **Effluent Quality:** Test outputs of current disposal methods against CPCB/NGT discharge standards.
- **Capacity Audit:** Review the 50 KLD co-treatment facility at the 30 MLD STP (Ramgarh Tal) and other mobile FSM station at Mahewa Mandi (Transport Nagar).
- **Reuse Potential:** Assess market demand for treated biosolids (compost) in agriculture, horticulture, and municipal parks (after chemical testing of heavy metals & toxic composition).

2. Review of Ongoing Initiatives

- **Active Tenders & Contracts:** Analyse DPRs of ongoing sewerage/STP works to determine committed faecal sludge co-treatment capacity.
- **Design Parameters:** Review septage receiving stations, screening mechanisms, and holding tank volumes.
- **Technology Compatibility:** Assess whether STP technologies (e.g., SBR/MBBR) are compatible with septage characteristics.
- **Timeline Synchronization:** Map commissioning timelines of ongoing plants against immediate sludge disposal needs.

3. Demand Forecasting & Gap Analysis

- **Future Generation Scenarios:** Forecast population growth for core city vs. peri-urban outgrowth (e.g., Mahewa, Transport Nagar).
- **Shift Factor:** Estimate households likely to transition from septic tanks to sewer networks once ongoing projects are complete.
- **Net Residual Septage Load:** Calculate sludge volume outside the sewer network.
- **Gap Identification:** Determine if ongoing STP augmentations suffice or if decentralized FSTPs are required.

4. Strategic Planning for Future Capacity

Scenario A: Augmentation of Ongoing Projects (Retrofitting)

- If the gap is small (<10–20 KLD): Propose retrofits to current STP designs (e.g., equalization tanks, dewatering units).

Scenario B: Decentralized Expansion (New Nodes)

- If the gap is large or spatially disconnected: Identify land parcels for decentralized FSTPs in peri-urban growth corridors (e.g., Zone D, Transport Nagar).

Phasing Plan

- **Phase 1 (Immediate – 0 to 2 Years):** Operationalize co-treatment at existing/upgrading STPs.
- **Phase 2 (Medium Term – 2 to 5 Years):** Commission 20 KLD FSTP for peri-urban gaps especially in Zone D.
- **Phase 3 (Long Term):** Transition FSSM infrastructure to integrate sewer mining and industrial sludge management.

5. Institutional & Policy Framework

- **Municipal Bylaws:** Draft and notify bylaws regulating desludging cycles, service standards, licensing, and penalties for illegal dumping.
- **Dedicated FSSM Cell:** Establish within GMC to coordinate containment, desludging, transport, treatment, and reuse.
- **Integration with ICCC:** Integrate with citizen apps/SMS for service requests, compliance monitoring, and grievance redressal.

6. Operation & Maintenance (O&M)

- **Ring-fenced Budgets:** Ensure continuous funding for FSSM operations.
- **Capacity Building:** Train municipal staff and private operators with quarterly refresher courses.
- **Service Contracts:** Establish contracts tied to performance indicators for desludging, transport, and treatment.
- **Preventive Maintenance:** Institute schedules for pumps, screens, drying beds, and mobile FSTPs, with independent audits.

Annexure 2: Cost estimates of retrofitting Takiya Ghat Nallah

Head / Component	Item Description	Unit Rate (INR)	Quantity	Amount (INR)
1. CIVIL WORKS (Bypass & Flow Control)				
1.1 Bypass Pipeline	RCC NP3 Pipe (800mm dia), laying, jointing, and backfilling for 28 MLD flow capacity	4,500 / m	2,400 m	1,08,00,000
1.2 Diversion Structure	Inlet Weir & Sluice Gate Concrete structure to divert excess monsoon flow into the bypass pipe.	Lump Sum	1 Unit	5,00,000
1.3 Chamber/Manholes	Inspection Chambers<small>Brick masonry/RCC manholes at 30m intervals for maintenance.	25,000 / each	80 Nos.	20,00,000
Sub-Total (Civil)				**1,33,00,000**
2. NBS & BIO-ENGINEERING				
2.1 Substrate Stabilization	Coir Geotextile (700 GSM) Woven coir matting anchored with wooden stakes to prevent soil scour.	120 / sqm	9,600 sqm	11,52,000
2.2 Site Preparation	Slope Dressing & Cleaning, trimming banks and removing sludge/debris before laying mats.	80 / sqm	9,600 sqm	7,68,000
2.3 Velocity Control	Energy Dissipation (Boulders), Random rubble/boulder placement in bed to break flow velocity.	1,500 / cum	200 cum	3,00,000
2.4 Gabion Repair	Gabion Check Dams/Edge Protection Refurbishing or adding localized gabion boxes at critical curves.	3,800 / cum	200 cum	7,60,000
2.5 Plantation	Vetiver & Typha Planting<small>Deep-rooted slips planted @ 20 slips/sqm through the coir mat.	15 / slip	1,92,000 slips	28,80,000
Sub-Total (NBS)				**58,60,000**
GRAND TOTAL	**(Excluding Land Cost)**			**1,91,60,000**

Annexure 3: Cost estimates of weed collection from Ramgarh Tal and generation of Bio CNG

Component	Specifications	Est. Cost (INR)
A. Harvesting & Logistics		
Mechanical Harvester	1 Unit of Aquatic Weed Harvester (e.g., Weed Harvester-100 or similar)	1,90,00,000
Transportation	2 Sealed Dump Trucks (Tipper) for transporting wet weed to plant site (25L each).	50,00,000
B. Bio-CNG Plant (50 TPD)		
Pre-Processing	Reception Pit, Wet Shredder/Macerator (critical for tough Hyacinth fiber)	1,50,00,000
Anaerobic Digesters	CSTR Digester Tanks (Glass Fused to Steel/RCC) with heating & stirring systems	8,00,00,000
Biogas Purification	Scrubber Unit (Vacuum Swing Adsorption or Membrane) to upgrade Biogas to Bio-CNG (95% Methane)	6,00,00,000
Compression & Bottling	High-pressure compressor (250 bar) and cylinder filling cascade	3,50,00,000
Solid-Liquid Separator	Screw press to separate digestate into solid manure and liquid fertilizer	50,00,000
C. Infrastructure		
	Civil works, piping, electrical, and land development (excluding land cost)	3,00,00,000
TOTAL PROJECT COST		**~ 24.9 Crores**

Annexure 4: Cost estimates of weed collection from ChiluaTal and value addition

Category	Item / Component	Specification / Quantity	Unit Cost (₹)	Total Cost (₹)
A. Machinery for Fuel				
	Biomass Briquetting Plant	1000 kg/hr Capacity (Hammer Mill + Flash Dryer + Piston Press)	18,00,000	18,00,000
	Electrical Installation	3-Phase Transformer, Commercial Meter, Panels, Wiring (50HP Load)	2,50,000	2,50,000
	Weighbridge	Small industrial platform scale (1 Ton)	30,000	30,000
B. Machinery for Boutique				
	Solar Tunnel Dryer	Polycarbonate UV-stabilized tunnel (for preserving fiber color)	1,50,000	1,50,000
	Processing Toolkit	Washing Tanks (Concrete), Sulfur Box, Manual Flattening Rollers	Lump sum	1,00,000
	Weaving Looms	Frame Looms for mats/baskets (5 Units)	20,000	1,00,000
C. Logistics & Harvest				
	Collection Boats	Flat-bottom FRP/Metal boats (5 Units)	60,000	3,00,000
	Transport Vehicle	Refurbished Tractor-Trolley or Loader (for Jetty to Plant transfer)	3,00,000	3,00,000
	Harvest Tools	Pitchforks, sickles, waders, safety boots, life jackets	Lump sum	50,000
D. Infrastructure (Civil)				
	Industrial Shed	2,000 sq. ft. PEB Tin Shed (Machinery & Storage) @ ₹300/sq.ft.	6,00,000	6,00,000
	Drying Yard	10,000 sq. ft. Brick Soling/Concrete floor (Essential for pre-drying)	60,000	6,00,000
	Jetty Platform	Temporary bamboo/wooden landing stage at Chillua Tal edge	1,00,000	1,00,000
E. Pre-Operative				
	Licensing & Permits	Udyam Reg, Pollution Control (UPPCB), GST, etc.	50,000	50,000
	Contingency	~5% of Project Cost for price fluctuations	-	2,20,000
GRAND TOTAL				**₹ 45,00,000**

Annexure 5: Ekla Bandha Eco-Friendly Riverfront Development

Project Area: ~44 ha
Project Length: ~1.10 km
Implementation Period: 1–2 Year

Sl. No.	Zone	Component / Description	Unit	Quantity	Rate (₹)	Amount (₹ Cr)
1	All	Site clearing, debris removal & grading	Ha	44	4,00,000	1.76
2	All	Topographic survey, soil investigation & DPR preparation	LS	1	—	1.00
3	A	Sandy river beach formation	Sqm	50,000	300	1.50
4	A	Immersion ponds with pitched edges	Nos	2	35,00,000	0.70
5	A	Permeable paved access areas	Sqm	18,000	1,100	1.98
6	A	Stone pitching / toe protection along river edge	Rm	1,200	10,000	1.20
7	B	Earthworks & floodplain landform shaping	Cum	1,60,000	300	4.80
8	B	Turfing & soil stabilisation	Sqm	1,20,000	100	1.20
9	B	Landscaped lawns & terraces	Sqm	1,10,000	450	4.95
10	B	Nature trails & jogging tracks (gravel/murrum)	Km	5.0	1.00 Cr/km	5.00
11	B	Green amphitheatre (earthen stepped seating)	LS	1	—	1.20
12	B	Picnic groves with seating	Nos	8	15,00,000	1.20
13	B	Bird watching tower (lightweight structure)	Nos	1	80,00,000	0.80
14	All	Plantation (guava + native flood-tolerant species)	Ha	30	6,00,000	1.80
15	C	Cafeteria (eco-friendly single storey)	Sqm	400	40,000	1.60
16	C	Public toilets (prefab/modular)	Nos	3	25,00,000	0.75
17	C	Parking areas with permeable paving	Sqm	15,000	1,400	2.10
18	C	Internal walkways & plazas	Sqm	22,000	1,400	3.08
19	All	Solar street lighting	Nos	200	40,000	0.80
20	All	Street furniture, bins & wayfinding signage	LS	—	—	0.90
21	All	CCTV & basic security systems	LS	—	—	0.70
22	All	Interpretation & eco-education signage	LS	—	—	0.50
23	All	Contingencies @ 5%	LS	—	—	2.06
—	—	**TOTAL PROJECT COST**	—	—	—	**₹43.35 Cr**

Annexure 6: Cultural–ecological integration & tourism activation Ekla Bandha

River: Rapti
Locations: Raj Ghat, Ram Ghat, Ekla Bandha
Project Nature: Cultural–ecological integration & tourism activation
Implementation Period: 1-2 Year

Sl.	Location	Component / Description	Unit	Quantity	Rate (₹)	Amount (₹ Cr)
1	All sites	Topographic survey, concept integration & DPR	LS	1	—	0.80
2	All sites	Unified design language (signage, railings, paving, lighting theme)	LS	1	—	0.50
3	Integration	River circuit with **2 electric boats** (basic models)	Nos	2	90,00,000	1.80
4	Integration	**Simple modular jetties** (non-floating, pile-supported)	Nos	3	40,00,000	1.20
5	Integration	Bridge under-deck & river-edge decorative lighting	LS	1	—	1.20
6	All sites	Thematic plantation (uniform species)	Ha	15	5,00,000	0.75
7	Raj Ghat	Smriti Van (Memorial Forest – soft landscape only)	Ha	5	0.60 Cr/Ha	3.00
8	Raj Ghat	Flood-resilient plantation on lower terraces	Ha	4	4,00,000	0.16
9	Raj Ghat	Softening of ghat platforms (green edges, seating)	Sqm	10,000	700	0.70
10	Ram Ghat	Ghat steps repair, resurfacing & handrails	Sqm	8,000	1,200	0.96
11	Ram Ghat	**Rapti Aarti infrastructure (basic, removable)**	LS	1	—	0.90
12	Ram Ghat	Light & sound system (portable / event-based)	LS	1	—	1.10
13	Ram Ghat	Traditional boats (non-electric, tourism scale)	Nos	4	18,00,000	0.72
14	Ram–Ekla	Pedestrian riverfront linkage under bridge (basic paving & lighting)	Rm	500	25,000	1.25
15	All sites	Public amenities (toilets, drinking water, kiosks)	LS	1	—	1.10
16	All sites	Benches, bins, railings & wayfinding signage	LS	1	—	0.90
17	All sites	CCTV & basic safety infrastructure	LS	1	—	0.70
18	All sites	Interpretation panels (culture, ecology, history)	LS	1	—	0.50
19	All sites	Event operations & river activity setup	LS	1	—	0.50
20	All sites	Contingencies @ ~5%	LS	—	—	0.85
—	—	**TOTAL PROJECT COST**	—	—	—	**₹18.19 Cr**

Annexure 7: Detailed Cost Estimates for creating water body database at city level and integration with the existing GMC ICCC

Total Waterbodies: ~130 (54 above 1 acre)
Framework: NIUA – Urban Waterbody Diagnostic Tool (UWBDT)
Implementation Period: 1-2 years

Sl. No.	Component Category	Component / Description	Scope & Remarks	Unit	Quantity	Rate (₹)	Amount (₹ Cr)
1	Baseline Mapping	Geo-referenced mapping of all waterbodies	Boundary, area, catchment (GIS)	No.	130	1,20,000	1.56
2	Baseline Mapping	Ownership, land-use & encroachment survey	Revenue data + field validation	No.	130	70,000	0.91
3	Hydrological Assessment	Connectivity with drains, rivers & floodplains	Desk + limited field checks	LS	—	—	0.80
4	Water Quality Profiling	Compilation of available data	UPPCB / GMC / Fisheries (no new lab works)	LS	—	—	0.60
5	UWBDT Assessment	Diagnostic scoring of waterbodies	Physical, ecological, risk parameters	No.	130	40,000	0.52
6	Database Development	City-level GIS & MIS database	Spatial + attribute database	LS	—	—	1.50
7	ICCC Integration	GIS dashboard integration with ICCC	Visualization & reporting	LS	—	—	1.40
8	Remote Sensing Support	Satellite imagery & change detection	Annual baseline + update	LS	—	—	1.00
9	Flood Risk Layer	Flood history & waterlogging overlays	Link with UFMC & IMD data	LS	—	—	0.90
10	Decision Support Tools	Priority ranking & action planning module	Rejuvenation & protection	LS	—	—	0.80
11	Inter-departmental Integration	Data sharing with GDA, UPPCB, Revenue	Access & workflows	LS	—	—	0.60
12	Capacity Building	Training of GMC & ICCC staff	GIS, dashboards, UWBDT	LS	—	—	0.50
13	Documentation & SOPs	Manuals, update protocols	Long-term sustainability	LS	—	—	0.45
14	Project Management	Coordination, reviews & reporting	During implementation	LS	—	—	0.50
15	Contingencies	Unforeseen technical gaps (~5%)	—	LS	—	—	0.75

Sl. No.	Component Category	Component / Description	Scope & Remarks	Unit	Quantity	Rate (₹)	Amount (₹ Cr)
—	—	**TOTAL PROJECT COST**	—	—	—	—	**₹12.29 Cr**

Annexure 8: Water Body Prioritisation list for Gorakhpur

Sl	Pond Name / Location	Physical Parameters			Water Quality & Hydrology			Social & Economic Potential			Physical Parameters	Water Quality & Hydrology	Social & Economic Potential	Priority as per scoring
		Extent of Encroachment	Buffer Zone Condition	Nature of Bed (Bottom)	Used water Inlets	Solid Waste Dumping	Dissolved Oxygen (DO)	Accessibility	Cultural Significance	Surrounding Land Use				
1	Dharmashala Lake, Near Railway Station North Gate	5	4	3	3	2	1	4	1	4	12	6	9	PRIORITY A
2	Sumer Sagar Lake, Near Golghar Kali Temple	4	3	3	2	2	2	3	1	4	10	6	8	PRIORITY A
3	Jharkhandi Mahadev	5	4	4	5	4	4	4	4	5	13	13	13	PRIORITY C
4	Divya Nagar Colony Lake	4	4	3	2	2	3	3	3	5	11	7	11	PRIORITY A
5	Khorabar Pokhra	3	4	4	4	4	4	4	4	4	11	12	12	PRIORITY C
6	Pond, Near Khorabar Durga Chowk	5	3	3	2	4	1	2	1	5	11	7	8	PRIORITY A
7	Mridalini/Siktaur Lake	5	2	4	5	3	1	4	3	5	11	9	12	PRIORITY A
8	Lake in Kajakpur	5	2	4	2	2	1	4	1	5	11	5	10	PRIORITY A
9	Lake Rail Vihar Colony, Behind GD Goenka Public School	5	5	5	5	5	2	4	1	5	15	12	10	PRIORITY A
10	Lake Rail Vihar Colony Ph-3, Behind Circuit House	5	5	5	5	5	5	4	1	5	15	15	10	PRIORITY C
11	Kataniya Lake	3	2	4	1	1	2	4	1	4	9	4	9	PRIORITY A
12	Basantpur Lake, Near Rajghat	3	2	4	2	2	2	3	1	4	9	6	8	PRIORITY A
13	Moti Pokhra	4	5	5	2	2	4	3	4	3	14	8	10	PRIORITY A
14	Mahesara Tal/Chillua Tal, Near Fish market	4	4	5	1	1	1	1	1	3	13	3	5	PRIORITY A
15	Lake near Bus charging Station, Mahesara Tal	5	3	4	3	4	1	1	1	3	12	8	5	PRIORITY A
16	Pond near Rohini River, Near Sheikhpurwa Masjid	5	5	5	3	3	3	3	3	1	15	9	7	PRIORITY B
17	Mahesara Water Lake	4	5	5	5	5	1	1	1	1	14	11	3	PRIORITY A

Sl	Pond Name / Location	Physical Parameters			Water Quality & Hydrology			Social & Economic Potential			Physical Parameters	Water Quality & Hydrology	Social & Economic Potential	Priority as per scoring
		Extent of Encroachment	Buffer Zone Condition	Nature of Bed (Bottom)	Used water Inlets	Solid Waste Dumping	Dissolved Oxygen (DO)	Accessibility	Cultural Significance	Surrounding Land Use				
18	Pond Near Bargadwa, Shobha Dairy Shop	4	5	5	5	3	1	1	1	3	14	9	5	**PRIORITY A**
19	Pond Near Rajendra Nagar	5	4	5	3	5	1	1	1	1	14	9	3	**PRIORITY A**
20	Pond Near 10 MLD STP Zone C	4	4	5	3	5	1	1	1	1	13	9	3	**PRIORITY A**
21	Pond Near Gorakhpur Skating Academy	5	3	4	2	3	1	3	1	5	12	6	9	**PRIORITY A**
22	Pond Near Ghosipurwa Kabristan	5	2	4	4	3	1	3	3	5	11	8	11	**PRIORITY A**
23	Pond of St. John's Church Gorakhpur	5	5	5	5	5	1	2	1	5	15	11	8	**PRIORITY A**
24	Pond Opposite of Baba Raghavdas Medical College	1	2	5	1	2	2	4	1	5	8	5	10	**PRIORITY A**
25	Mirzapur Lake	1	2	5	2	3	5	3	4	5	8	10	12	**PRIORITY A**
26	Pond Near Gausiya Masjid	4	2	4	1	1	4	4	1	5	10	6	10	**PRIORITY A**
27	Pond in Fertiliser Colony	5	3	4	5	5	4	4	1	3	12	14	8	**PRIORITY B**

Annexure 9: Detailed Cost Estimates for Gurdahiya Nallah Parks and Cycle track project

Project Length: 9.0 km
Developed Length: 18.0 km (both banks)
Available Width: ~4.5 m on each side
Excluded Scope: Drain restoration, desilting, STP & treated used water pumping works

Parks Considered in the Costing

Number of parks: 5 pocket / neighbourhood parks

Type: Linear pocket parks and rest nodes integrated along the nallah edge (not large destination parks)

Area Assumption

Item	Assumption
Average area per park	**0.4–0.6 ha** (≈ **1.0–1.5 acres**)
Total park area considered	**2.0–3.0 ha** (≈ **5–7.5 acres**)
Location logic	At road crossings, wider ROW sections, neighbourhood nodes

These are small, flood-compatible parks with seating, shade trees, play/open lawns, and fitness/rest areas- designed to fit within the 4.5 m available width per side, expanding locally where space permits.

Sl. No.	Component Category	Component / Description	Specification / Remarks	Unit	Rate	Quantity	Amount (₹ Cr)
1	Cycle & Pedestrian Infrastructure	Cycle Track	2.5 m wide, asphalt / permeable surface	km	0.85 Cr/km	18	15.30
2	Cycle & Pedestrian Infrastructure	Pedestrian Walkway	1.8–2.0 m wide, paved	km	0.65 Cr/km	18	11.70
3	Cycle & Pedestrian Infrastructure	Kerbs & Edge Treatment	RCC kerbs, tactile paving	km	0.10 Cr/km	18	1.80
4	Cycle & Pedestrian Infrastructure	Safety Railings & Parapets	Along drain edge & crossings	km	0.10 Cr/km	18	1.80
5	Green Buffers & Landscaping	Linear Plantation & Green Buffer	Native, flood-tolerant species	km	0.25 Cr/km	18	4.50
6	Green Buffers & Landscaping	Pocket Parks / Rest Nodes	5 linear neighbourhood parks	No.	0.70 Cr/No.	5	3.50
7	Green Buffers & Landscaping	Rain Gardens & Sponge Elements	Bio-swales, infiltration beds	LS	—	—	2.00
8	Green Buffers & Landscaping	Street Furniture & Signage	Benches, bins, wayfinding	LS	—	—	2.00
9	Lighting & Utilities	Street Lighting	LED / solar hybrid poles	km	0.17 Cr/km	18	3.00
10	Lighting & Utilities	Utility Shifting & Protection	Water supply, power, OFC	LS	—	—	1.50

Sl. No.	Component Category	Component / Description	Specification / Remarks	Unit	Rate	Quantity	Amount (₹ Cr)
11	Lighting & Utilities	Fencing & Access Control	Anti-encroachment fencing	LS	—	—	1.50
12	Lighting & Utilities	Minor Structures	Toilets, kiosks, guard points	LS	—	—	1.50
13	Professional & Risk Provisions	DPR, Design & Supervision	Consultancy services	LS	—	—	2.00
14	Professional & Risk Provisions	Contingencies	Unforeseen works	LS	—	—	2.50
15	Professional & Risk Provisions	Price Escalation & Risk Buffer	Inflation & execution risk	LS	—	—	3.00
TOTAL PROJECT COST				**—**	**—**	**—**	**₹57.6 Cr**